Cat. No. S101-E1-06

KP100L-OD-_

Grid Connect Photovoltaic Inverter

USERS MANUAL

Note: Aug, 2012

KP100L have the compatibility with thin-film module only approved by Omron and thin film maker.

Please confirm the compatible thin-film module by contacting Omron before using thin-film module.

OMRON

Introduction

Thank you for choosing the KP100L Grid Connect Photovoltaic Inverter (hereinafter called "the KP100L" or “product(s)”). This User's Manual (hereinafter called "this manual") describes essential information regarding functions, performance, usage, maintenance and service of the KP100L.
The KP100L is designed for use in Grid Connect Solar Systems. The installation must be always carried out by qualified person with knowledge of electrical systems and according to applicable international standards for electrical installations. If questions arise in connection with installation, operation or maintenance of KP100L, contact the sales person or an authorized service person.
The software and the protective functions are not accessible to the user and therefore cannot be modified.

- This manual is intended for: Users and Installers of the KP100L
- Read this manual carefully and follow the instructions and safety precautions to ensure that you are using and maintaining the KP100L safely and correctly. Read all other manuals for all of the other equipment to be used in this system.
- Keep this manual in a safe location near the equipment so that it is available for reference when required.

Read and Understand this Manual

Read and understand this manual before using the KP100L. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY
OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of five years (or other period if specified) from date of sale by OMRON. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY
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Application Considerations

SUITABILITY FOR USE
OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products. At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use. The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products: • Uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual. • Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations. • Systems, machines, and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to the products. NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Disclaimers

PERFORMANCE DATA
Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

CHANGE IN SPECIFICATIONS
Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

DIMENSIONS AND WEIGHTS
Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ERRORS AND OMISSIONS
The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

PROGRAMMABLE PRODUCTS
OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

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Safety Precautions

■Indications and Meanings of Safety Information

In this user's manual, the following precautions and signal words are used to provide information to ensure the safe use of the KP100L.
The information provided here is vital to safety. Strictly observe the precautions provided.

■Meanings of Signal Words

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or in property damage.

■Meanings of Alert Symbols

Example of symbols	
	General **Used for general CAUTION, WARNING, or DANGER precautions for which there is no specified symbol.**
	High temperature precaution **Used to warn of the risk of minor injury caused by high temperatures.**
	General **Used for general prohibitions for which there is no specific symbol.**
	General **Used for general mandatory action precautions for which there is no specified symbol.**
	Electric shock precaution **Used to warn of the risk of electric shock under specific conditions.**
	Always ground **Used to instruct the user to always connect the ground wire when using a device equipped with a safety ground terminal.**

Important user information:

Observe the following warnings and cautions when using the KP100L.

⚠ WARNING

Significant property damage may possibly occur. Do not use the product in other country than the designated country.

Functional lesion by injury and fire damage may possibly occur. Do not remove the MC cap on the back of the product when you exchange the FAN Assembly.

Inquire at the place of purchase or ask an authorized service person for how to properly dispose of the product.

Injury by electric shock may possibly occur. Read this manual before installation, operation and maintenance of the product, and follow the instructions carefully.

Injury by electric shock may possibly occur. Do not open the cover foreside R when the product is energized.

Significant injury by electric shock may possibly occur. Do not touch the terminal of the MC connector. Do not remove the MC connector by any method other than that specified in the instruction.

⚠ CAUTION

Burn injury may occasionally occur. Do not touch the upper part of the product while operating or immediately after having turned off power.

Fire damage or functional lesion of internal part may occasionally occur. Do not obstruct the heat sink or place any objects within 200mm of the heat sink.

Fire damage and malfunction may occasionally occur. Do not use the product after it has been dropped or subjected to a strong impact.

Functional lesion by fire damage may occasionally occur. Do not unfasten the MC connector and clamp cable during operation.

The limitation of the output electric power by the ventilation trouble may occasionally occur. Clean the top and bottom of the heat sink regularly.

Injury or fire by electric shock may possibly occur. Do not open, disassemble, modify, or repair the cover front and the cover foreside L during operation.

Important installer information:
Observe the following warnings and cautions when installing the KP100L.

⚠ WARNING

	Significant property damage may possibly occur. Do not use the product in other country than the designated country.
	Significant property damage may possibly occur. Do not use the product if the country setting is incorrect.
	Functional lesion by injury and fire damage may possibly occur. Do not remove the MC cap on the back of the product when you exchange the FAN Assembly.
	Significant property damage may possibly occur. Make sure installation is performed by an authorized person with the relevant qualification from the electric power company in the region.
	Electric shock and significant property damage may possibly occur. Confirm the polarity of the cable from the solar modules and from the grid before connecting.
	Fire by loose connection of AC terminal block may possibly occur. Confirm there is no looseness in the screw of the AC terminal block during maintenance.
	When you are unable to adequately tighten the screw of AC terminal block, fire from a loose connection may possibly occur. Insert the electric cable inside the AC terminal block by using special rod terminal and crimping pliers, and tighten the screw by tightening torque to 1.2-1.5N•m.
	Fire by loose connection of the MC connector may possibly occur. Use the specialized tool for the crimping process of the MC connector. Insert the MC connector until it is fully locked.
	Injury by electric shock may possibly occur. Read this manual before installation, operation and maintenance of the product, and follow the instructions carefully.
	Injury or functional lesion by electric shock or burn injury may possibly occur. Do not install the product in places where a child's hand can reach.
	Injury by electric shock may possibly occur. Do not open the cover foreside R when the product is energized.
	Significant injury by electric shock may possibly occur. Do not touch the terminal of the MC connector. Do not remove the MC connector by any method other than that specified in the instruction.
	Significant injury by electric shock may possibly occur. Do not open the cover foreside R and do not touch the MC connector for three minutes after turning OFF the breaker of the grid side and the breaker of the solar module side.
	Injury by electric shock may possibly occur. Connect the PE cable to the earth.

⚠ CAUTION

Burn injury may occasionally occur. Do not touch the upper part of the product while operating or immediately after having turned off power.

Fire damage or functional lesion of internal part may occasionally occur. Do not obstruct the heat sink or place any objects within 200mm of the heat sink.

Fire damage and malfunction may occasionally occur. Do not use the product after it has been dropped or subjected to a strong impact.

Breakdown of DC input plug may occasionally occur. Do not put the product without the shock-absorbing material on ground with the DC input plug at the bottom.

Injury may occasionally occur. Transport and place the product carefully using two or more persons.

Functional lesion by the fall of the product may occasionally occur. Use the installation parts and materials that are included with the product.

Functional lesion by fire damage of terminal may occasionally occur. Detach the MC connector after turning off the breaker of the solar modules side. When the current flows, do not insert and remove the MC connector.

Break down or deterioration of the solar modules may occasionally occur. Install the breaker between the transformer and the KP100L when you connect the transformer. Connect the Neutral of the transformer to the earth.

Breakdown of internal part by static electricity may occasionally occur. Wire cables after discharging static electricity.

Functional lesion by fire damage may occasionally occur. Confirm there is no looseness of the AC cable clamp, the communication cable clamp and the AUX cable clamp. Confirm the MC connector is locked.

Injury or fire by electric shock may possibly occur. Do not open, disassemble, modify, or repair the cover front and the cover foreside L during operation.

Human hazard by electric shock or property damage by fire damage may occasionally occur. Mount the enclosed MC caps onto MC connectors that are not used.

Electric shock or fire by the foreign body going into the product may occasionally occur. Prevent foreign objects body from invading from getting inside when you are installing wiring.

Functional lesion by injury and fire damage by the fall of the product may occasionally occur. Install the product in a location where the product's weight (41.5kg) can be withstood (the power of 176N•m torque per one screw should be acceptable).

Precautions for Safe Use

To install, transport and maintain the product safely, follow the precautions below:

■Location

Allow for 200mm or more between the following:

- Between the product and the ceiling or eave
- Between the product and the floor
- Between the product and right and left wall

When you install multiple KP100Ls, allow for 200mm or more on the side of each KP100L.

Do not install a KP100L directly above another KP100L or any other product or installation generating considerable heat.

Do not install in an outdoor location where the product receives direct sunlight or rain.

Do not install the product in places that are accessible by unqualified persons or near places where persons work:

- It is a high power product and high voltages are generated when the product is operating.
- High audible noise may be generated when the product is operated.

■Transporting

Provide sufficient safety measures, such as scaffolding, to minimize hazards during installation.

■Installation and Wiring

Make sure you do the following when you install the product.

(1) Use the accessories included with KP100L.

(2) Make sure there is neither danger nor malfunction by the peripheral and the wire, etc. other than the accessory.
- When wiring to the AC terminal block, do not insert two or more wires into one terminal.
- Use the wire of the diameter that corresponds to the capacity of the Solar modules. If you don’t, fire or smoke may occur.

(3) IP65 performance can not be provided, if you don't follow these instructions:
- Use a cable measuring φ18.5-20.5mm when you use the rubber bush of one hole for the AC cable clamp.
- Use five cables measuring φ3.5-4.0mm when you use the rubber bush of five holes for the AC cable clamp.
- Use a cable measuring of φ4mm for the communications cable and the AUX cable.
- Tighten the cable clamp.
- Tighten the screws of the cover foreside R by tightening torque to 1.5-1.7 N·m.

(4) Make sure the wire doesn't come off the terminal block after wiring the communication wire and the AUX wire to the terminal block.

■Exchanging Fans (FAN Assembly)

Make sure to follow these precautions when exchanging FAN Assembly.

(1) Exchange the FAN Assembly after turning off the breaker of the grid side and **the breaker** of the Solar module side and allow 3 or more minutes to pass. Electric shock and injury may occur.

(2) Use the specified FAN Assembly.

(3) Make sure the mounting direction of the FAN Assembly.

(4) Tighten the screw correctly by tightening torque to 1.5-1.7N·m after exchanging FAN Assembly.

(5) Connect each connector of the FAN Assembly to the product correctly.

■Solar Module

- Do not connect the solar module if it has an open-circuit voltage in excess of 850 VDC.
- Do not connect the solar module if it requires earthing of negative or positive poles.

■Breaker

- Use the breaker that corresponds to the capacity of the solar modules for the breaker of the Solar modules side.
- Use a 20A trip breaker with B or C or D trip characteristics the grid side breaker.

■Maintenance - Inspection

- Be sure to inspect the condition of the installation and the wiring before undertaking a trial operation.
- To achieve the IP65 performance, regularly tighten the cable clamp.

Precautions for Correct Use

To prevent an adverse effect on operation, take the following precautions as shown below.

■Installation

- Install the product in a correct direction.
- Do not install the product in the following places.
  - (1) Locations subject to significant temperature change.
  - (2) Locations subject to volatile, flammable, corrosive, or other toxic gases.
  - (3) Locations subject to vibration and violent shaking.
  - (4) Locations subject to water vapor, oil vapor, or condensation.
  - (5) Locations where the product may be immersed in water.
  - (6) Locations subject to electric fields, direct sunlight, poor ventilation
    (ex. Narrow places where the ventilation would be obstructed or the ambient temperature conditions would be exceeded.).
  - (7) Locations subject to temperature and humidity conditions outside of the following ranges
    - Temperature: –20 to 60°C
    - Humidity: 4 to 100%RH (Without condensation or freezing)
  - (8) Locations more than 2,000 m above sea level.
  - (9) Locations subject to saltwater spray, such as on oceangoing vessels or near a sea coast.
  - (10) Locations subject to falling snow, accumulated snow, or wind-blown snow.
    Protect the product by building a protective roof when you install the product in a snowy region.
  - (11) Locations near highly combustible material or heat sources (stoves, heaters, boilers, etc).
  - (12) Locations subject to damage to the wiring by animals or other factors.
    Protect the wiring by, for example, placing in ducts.
  - (13) Locations near equipment (such as a radio or TV) that is likely to be affected by electric waves, or too near an antenna.
  - (14) To prevent humidity during installation procedures do not leave the KP100L cover foreside R open more than the necessary time for wiring (one hour), in case of delay please close the cover foreside R and proceed to wiring procedures afterward.

■Use of the Product

- Do not stand on the product or place any objects on the product.
- Serious human hazard by fire may possibly occur. Do not use the product in a flammable gas atmosphere (including flammable sprays such as pesticides).
- Electric shock or fire may occur. Ask an authorized service person or a qualified person with knowledge of electrical systems for assistance when you install, add on, move or reinstall the product.

■Surge protection

- Install the surge measures circuit corresponding to the output voltage and input voltage to protect the inverter from lightning strike.
- For proper operation, don't install products following locations;
  (1) Locations where surge voltage of the grid is generated by influence of neighborhood facilities and equipment.
  (2) Locations where the grid is unstable caused by influence of neighborhood facilities and equipment.
  (3) In factory or the vicinity where the grid is unstable.
  (4) Locations subject to electronic noise that ungrounded consumer electronics generate.

■Maintenance and Inspection

- Confirm during maintenance that there is no abnormality such as rust on outside of the product.

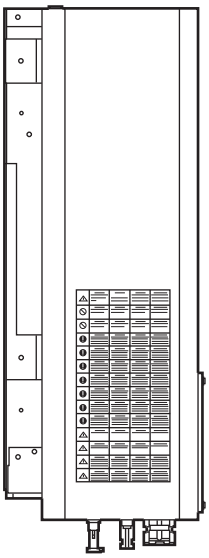
■Storage

- Store in locations where the temperatures are within the range of −25 to 60°C (with no condensation or icing), and the humidity is a maximum of 95 % maximum.
- Store in locations that are no more than 2,000 m above sea level.

Safety Labels

■Safety Labels and Hazard Description

The Warning labels are located on the KP100L as shown in the follow illustration.
Be sure to follow the instructions contained in the label.



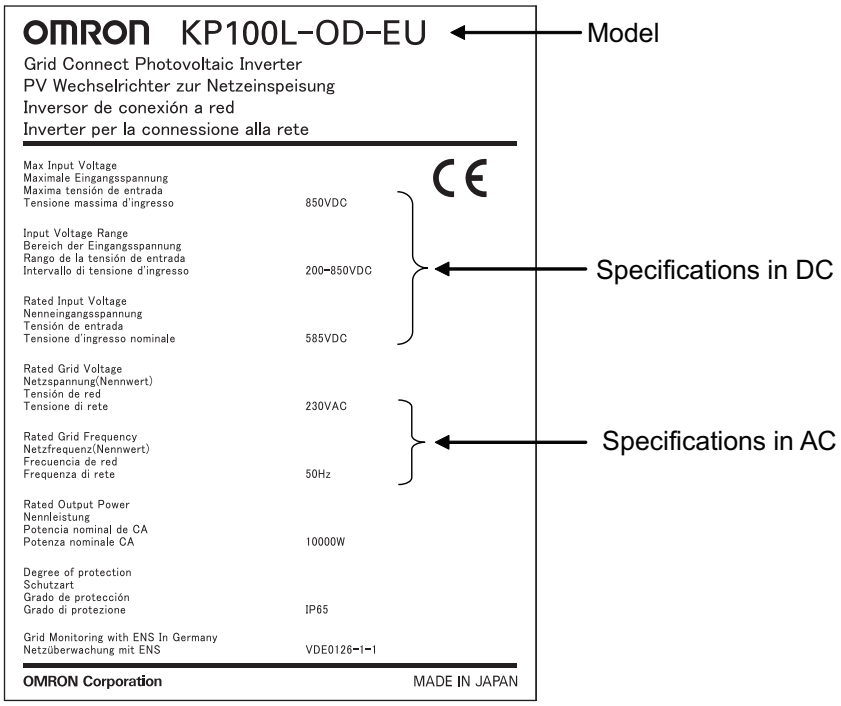
	CAUTION	ACHTUNG	ATENCIÓN	ATTENZIONE
	Do not touch the upper part of the product. Hot surface, heat injury hazard.	Verletzungsgefahr durch erhöhte Temperaturen. Vermeiden Sie Kontakt mit den Oberflächen des Produkts.	No toque la parte superior del producto. Superficie caliente, peligro de lesión causada por calor.	Non toccare la parte superiore del prodotto. Possibilità di lesioni dovute ad alte temperature in determinate condizioni di funzionamento del prodotto.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Do not use the product in other country than the designated country.	Dieses Produkt darf nur im Bestimmungsland in Betrieb genommen werden.	No utilice el producto en un pais distinto al pais seleccionado.	Non usare il prodotto in nazioni differenti da quelle indicate.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Do not use the product with a mistake of the country setting.	Stellen Sie sicher, dass die Ländereinstellung der des Verwendungsland entspricht.	No utilice el producto con una configuración errónea del pais.	Non utilizzare il prodotto in una nazione differente da quella impostata.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Execute the installation by a person who has the qualification that authorized by the electric power company in the region.	Installation und Inbetriebnahme muss durch eine qualifizierte und durch das Energieversorgungsunternehmen authorisierte Person erfolgen.	Ejecute la instalación de este producto por una persona con la cualificación autoirzada por la compañía eléctrica de la región.	Fate eseguire l'installazione da una persona qualificata, riconosciuta dagli enti locali competenti.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Use the specialized tool for the crimping process of the MC connector. Insert the MC connector surely until locking.	Verwenden Sie ausschließlich das Crimpwerkzeug für den MC Steckverbinder. Stellen Sie sicher dass der Steckverbinder vollständig eingerasted ist.	Utilice la herramienta especial para el proceso de crimpado de los conectores MC. Inserte los conectores MC con seguridad hasta que se bloqueen.	Utilizzate attrezzatura specializzata per il montaggio dei connettori MC. Inserire il connettore MC in maniera sicura fino al suo bloccaggio.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Do a correct connection after confirming the polarity of the cable from the solar modules and from the grid.	Vergewissern Sie sich über den korrekten Netzanschluss und Polaritäten, bevor Sie das Gerät in Betrieb nehmen.	Realice la conexión correcta después de confirmar la polaridad del cable desde los módulos solares y desde la red de CA.	Effettuare un cablaggio corretto dopo aver verificato la polarità dei cavi del pannello fotovoltaico e della rete.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Insert the electric cable in the inner of AC terminal block by using special Rod terminal and crimping pliers,and tighten the screw by tightening torque of 1.2–1.5N•m.	Führen Sie das AC Anschlusskabel in den Klemmblock ein und stellen Sie die Verbindung mit 1.2–1.5N•m sicher.Verwenden Sie ausschließlich die bestimmungsgemäßen Anschlusshülsen und Crimpwerkzeuge.	Inserte el cable eléctrico en la parte interior del bloque de terminales de CA usando punteras y herramientas de crimpado. Apriete los tornillos con una par de apriete de 1.2–1.5N•m.	Inserire il cavo elettrico nella parte anteriore del blocco terminali AC usando appositi puntalini e pinze crimpatrici.Serrare le viti in base alla coppia indicata: 1.2–1.5N•m.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Confirm there is no looseness in the screw of the AC terminal block when checking the maintenance.	Überprüfen Sie die Anschlüsse auf gelöste Schrauben ebi jeder Wartung.	Confirme que no hay ningún tornillo suelto en el bloque de terminales de CA cuando realice un mantenimiento.	Verificare la corretta tenuta delle viti del blocco terminali AC durante le operazioni di manutenzione.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Ask to the store where you purchased the product or to an authorized service person when disposing of the product.	Stellen Sie eine ordnungsgemäße Entsorgung sicher. Für Fragen kontaktieren Sie bitte Ihren OMRON partner.	Pregunte a su proveedor donde adquirió el producto o a un servicio autorizado cuando quiera deshacerse del producto.	Rivolgersi al rivenditore o a personale autorizzato per lo smaltimento del prodotto.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Connect the PE cable to the earth.	Stellen Sie die vorschriftsmäßige Verbindung von PE mit der Schutzerde her.	Conectar el cable PE a tierra.	Collegare il cavo PE alla apposita terra.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Read the manual.	Lesen Sie die Betriebsanleitung.	Lea el manual del producto.	Leggere attentamente il manuale.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Do not install the product in places that child's hand reaches.	Stellen Sie sicher dass Kinder und Jugendliche keinen Zugang zu Geräten in Betrieb haben.	No instale el producto en lugares donde puedan alcanzar manos de niños.	Non intallate il prodotto in luoghi raggiungibili dalle mani dei bambini.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Do not touch the terminal of the MC connector. Do not remove the MC connector excluding the instruction of this manual.	Berühren Sie den MC verbinder nie. Zum Lösen der Steckverbindung folgen Sie unbedingt den Anweisungen der Betriebsanleitung.	No toque los terminales del conector MC. No retire los conectores MC aparte de las instrucciones de este manual.	Non toccare i terminali MC. Non rimuovere i connettori MC senza aver letto le istruzioni indicate in questo manuale.
	WARNING	WARNUNG	ADVERTENCIA	AVVERTENZA
	Do not open the cover foreside R and not touch the MC connector within 3 minutes after turning OFF the breaker of the grid side and the solar module side. Residual high voltage, Electric shock hazard.	Hohe Restspannung ! Gefahr durch elektrischem Schlag. Stellen Sie sicher dass frühestens 3 Minuten nach kompletter Trennung von Netz und MC das Gerät geöffnet oder an spannungsführenden Teilen gearbeitet wird.	No abra la tapa frontal R y no toque los conectores MC durante los 3 minutos siguientes a apagar el interruptor de la red CA y los interruptores en el lado de los módulos solares. Peligro por shock eléctrico por tensión residual.	Non aprire il pannello frontale e non toccare i connettori MC prima di 3 min dopo aver spento l'inverter aprendo l'interruttore lato CA e C.C. Esiste il rischio di shock elettrico dovuto ad una alta tensione residua.

Checking After Unpacking

■Checking the Product

On delivery, be sure to check that the delivered product is the KP100L that you ordered.
Should you find any problems with the product, immediately contact your nearest local sales representative or OMRON Sales Office.

● Checking the rating label



● Checking the Model

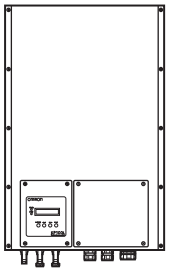
Type:KP100L-OD-□□

EU / EU-T	Germany, Spain, Italy, France, Greece, Czech Republic, Denmark, Portugal, Turkey, Austria, Republic of South Africa
KR	Korea

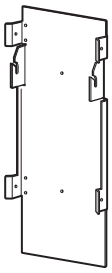
■Checking the Accessories

The following items are included in the KP100L package. Check that you have all of the items shown below before you start the installation.

KP100L



Mounting base plate



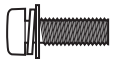
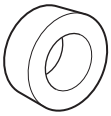
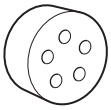
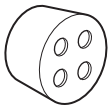
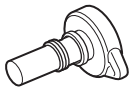
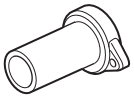
QIG (Quick Install Guide)

Only KP100L-OD-EU/EU-T

User’ s Manual

Only KP100L-OD-KR

For KP100L-OD-EU/EU-T, PDF file is provided.Consult your OMRON representative to get PDF file

Items	Number	Note	
M5.8 x 45mm Mounting Screw	8	For installation of Mounting base plate. Use a Phillips screwdriver.	
Snap Bushing	8	Tool of assistance when screw is stopped to hard wall like concrete.	
M4 x 12mm Screw with plain washer and spring washer	5	For fixation of product set up in Mounting base plate (4 pieces are for mounting, one peace is a spare) Use a Phillips screwdriver.	
M4 x 6mm Screw with plain washer and spring washer	2	Spare screw to fix the cover foreside R. Use a TX20 Torx screwdriver.	
Rubber Bush	1	For connection of AC cable	
	1	For connection of AC cable	
	2	Spare rubber bush For connection of AUX and communication	
MC Caps	3	Caps for MC connection (+) These are attached to KP100L.	
	3	Caps for MC connection (-) These are attached to KP100L	

■Retain the Original Carton Box

Keep the original carton box and use it when you transport the KP100L for repair service, etc.

About this manual

This Manual has been compiled for user's and installer's convenience as follows.

		Content / Exposition	For Users	For Installers
Introduction and Safety Precautions		Describes information for safety use.	√	√
Chapter 1	Overview	Describes features and names of parts.	√	√
Chapter 2	Design	Provides external dimensions, installation dimensions and other information necessary for design.		√
Chapter 3	Operation	Describes the name of parts of the operations and the monitor. Describes the monitor function of the product.	√	√
Chapter 4	Maintenance Operations	Describes the causes and their countermeasures if the product fails, including the solutions to possible troubles (troubleshooting).	√	√
Chapter 5	Inspection and Maintenance	Describes inspection and maintenance of the product.	√	√
Chapter 6	After-Sales Service	Describes after-sales service and contact of the product.	√	√
Chapter 7	Specifications	Describes specifications of the product.	√	√
Appendix		Describes contents of the displays other than English.	√	√

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1

Overview

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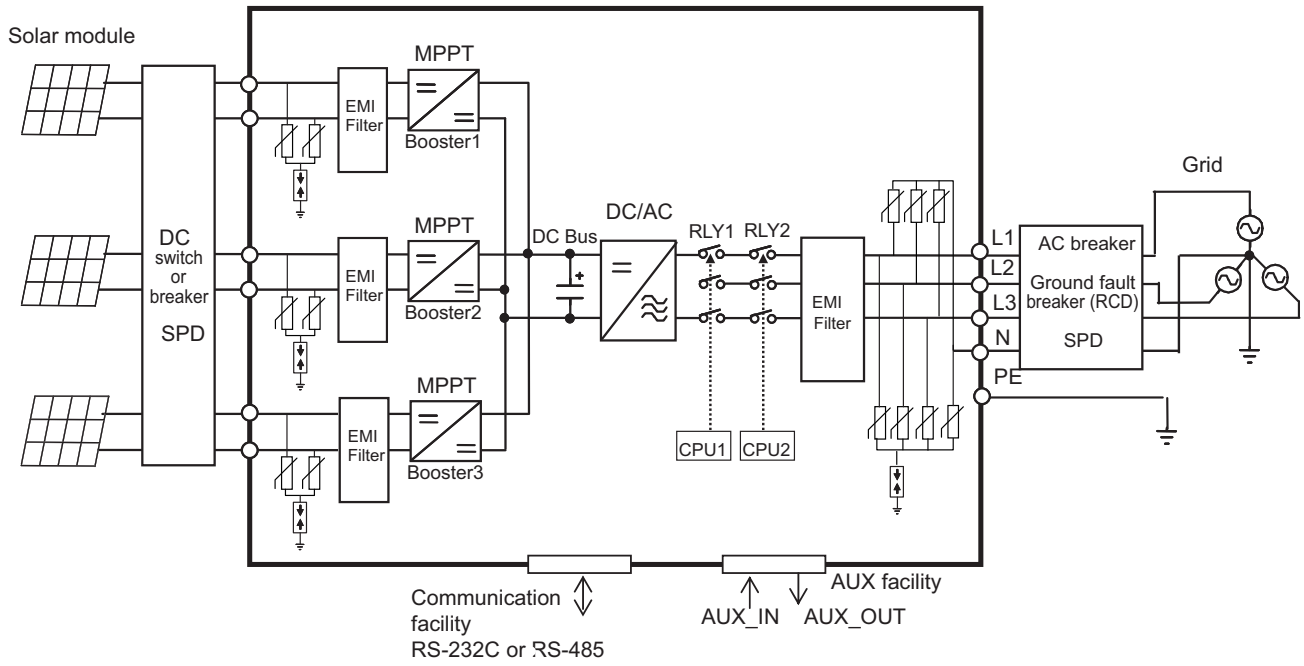
1.1 Model Name

Model	Country
KP100L-OD-EU / EU-T	Germany, Spain, Italy, France, Greece, Czech Republic, Denmark, Portugal, Turkey, Austria, Republic of South Africa
KP100L-OD-KR	Korea

1.2 Functions

■System description

The KP100L converts DC power obtained from the solar modules into the AC power that is used in businesses, and enables interconnection with the grid.
This makes it possible to purchase power from the grid during periods when the load is high, and to sell power to the grid during periods when the load is low. (Please note that a contract must be concluded with the grid for this purchasing and selling transaction.) The system configuration of the KP100L is shown in the figure bellow.

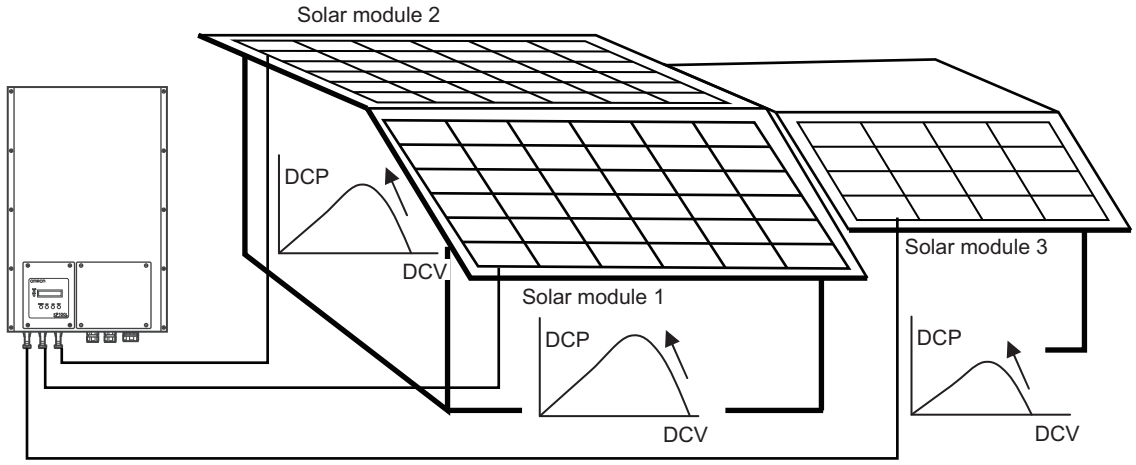


■MPPT (Maximum Power Point Tracking)

The KP100L has 3 MPPT and each MPPT operates idependently.

The output power of solar modules varies depending on the sunshine irradiation and the temperature of the modules. In order to use the unstable output of the solar modules efficiently, the KP100L searches for the operating voltage that will produce the maximum output power while it converts the DC input voltage.

The topology of the MPPT is mainly a booster. Each booster steps up the DC input voltage to a higher DC Bus voltage. User can connect differently-aligned string as 3 MPPT operate independently as illustrated in the figure bellow. This construction achieves high power generation and flexible sizing of PV string.



Input specifications:

a) DC input voltage range: 200 to 850 VDC

b) MPPT voltage range:
rated power: 320 to 825VDC
operation power: 200 to 850VDC

Input limitations:

a) Maximum input open-circuit voltage: 850 VDC

b) Maximum input current per input: 13 ADC
MPPT controls not to exceed 13 ADC.

c) Maximum input power per input: 5500 W
MPPT controls not to exceed 5500 W.

■DC Bus

The three sets of MPPT store DC power via the DC/DC booster to the DC Bus.

■DC/AC Inverter

The DC Bus is connected to the DC/AC inverter, which converts DC power to AC power.

■Grid-Connection Relays

The two relays, RLY1 and RLY2, control the connection of the KP100L to grid via CPU1 and CPU2.

■Output Lines

4 output lines (L1, L2, L3 and N) and PE represent the 3-phase 4-wire AC power transmission to grid.

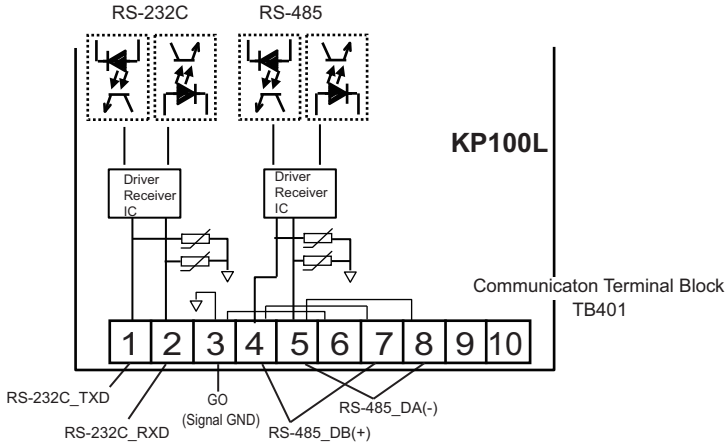
■Surge protection and overvoltage protection

The KP100L has the protection on AC side and the solar module side using varistors and arrestors. Regarding overvoltage protection, it is classified as Overvoltage Category III on AC side and Overvoltage Category II on the solar module side according to EN50178.

For lightning protection of solar system, protection level is established by a risk assessment of solar system. Provision of lightning protection is the responsibility of the designer of PV system. Refer to section "2.2 Application information" for your reference.

■Communication Facility

The KP100L has RS-485 and RS-232C communication. They are isolated by photo-coupler and communication signal lines are protected by varistor.



RS-232C Communications

The simplest and least expensive way to communicate between a single KP100L and a personal computer is to connect directly via RS-232C ports. The maximum cable length between the personal computer and the KP100L is 15 m.

Baud rate is 4,800bps, 9,600bps or 19,200bps. Default value is 9,600bps.

Available communication protocol is Compoway/F.

RS-485 Communications

To communicate with multiple KP100L Units, you can connect them to a personal computer via RS-485 ports. The maximum cable length is 500 m.

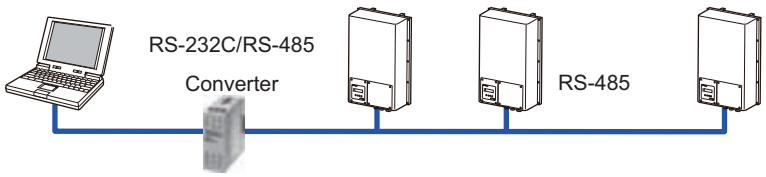
RS-485 allows communication with up to 31 Units.

RS-485 communications require a cable of the appropriate length and a personal computer installed with monitoring software.

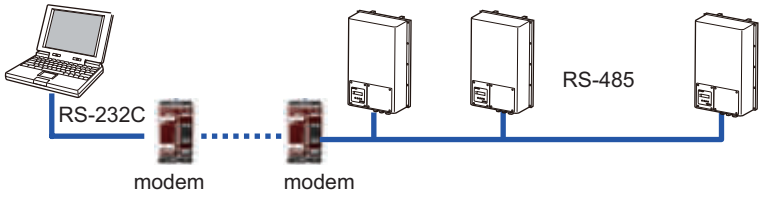
Baud rate is 4,800bps, 9,600bps or 19,200bps. Default value is 19,200bps.

Available communication protocol is Compoway/F or MODBUS.

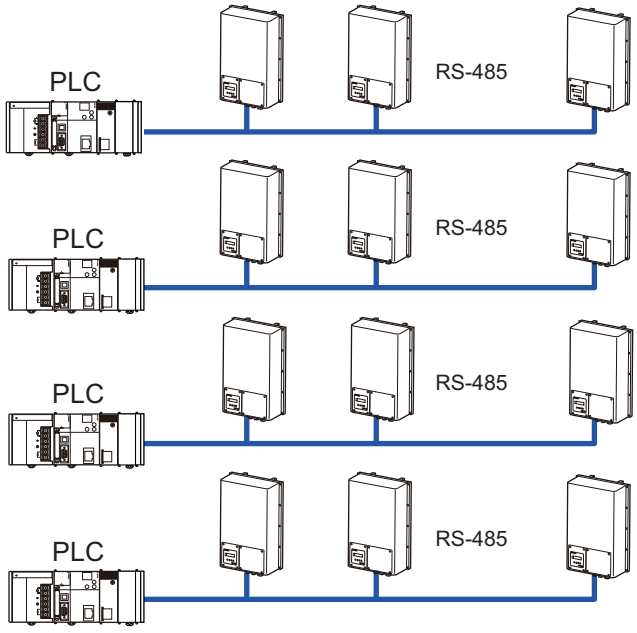
[example 1] up to 31 units



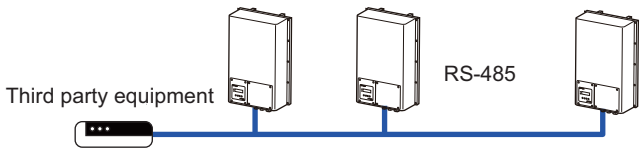
[example 2] up to 31 units



[example 3] PLC(Programmable Logic Controller):up to 4 units KP100L:up to 124 units



[example 4] Third party system

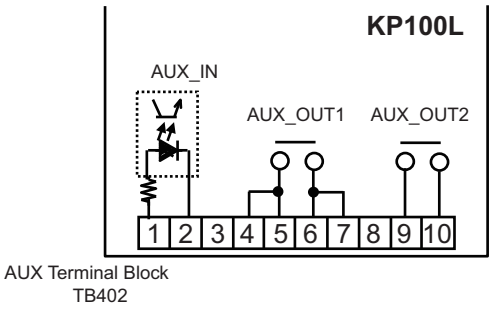


■AUX Facility

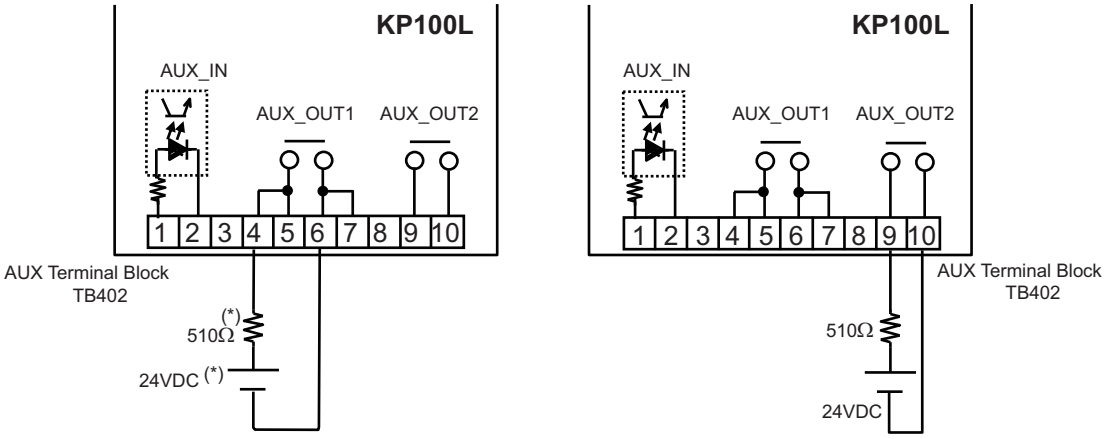
Relay Output

The KP100L has the 2 relays for 2 output signals of the table below. Refer to section "3.5 Mode Selection Display" for the setting of the output signal. Refer to section "2.4 Wiring" for connecting the AUX cable.

Name	Type of contact	Specifications
AUX_OUT1	SPST-NO	250 VAC / 1 A, 30 VDC / 1 A (Resistive load)
AUX_OUT2	SPST-NO	Minimum permissive load 20mA



[Example when you use AUX_OUT1 or AUX_OUT2]



(*)The external DC voltage and resistance value are example.
Select appropriate value according to your application.

[Example when you use AUX_OUT1 of multiple products]

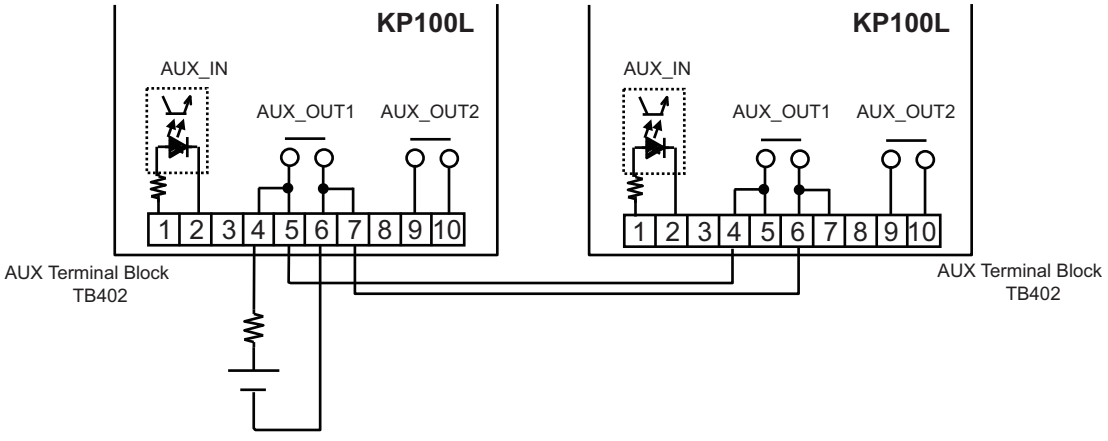
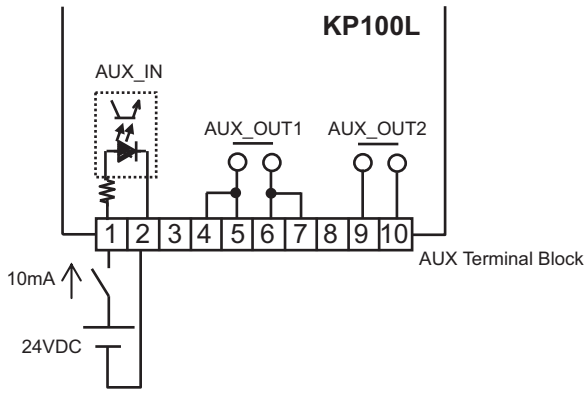


Photo-Coupler Input

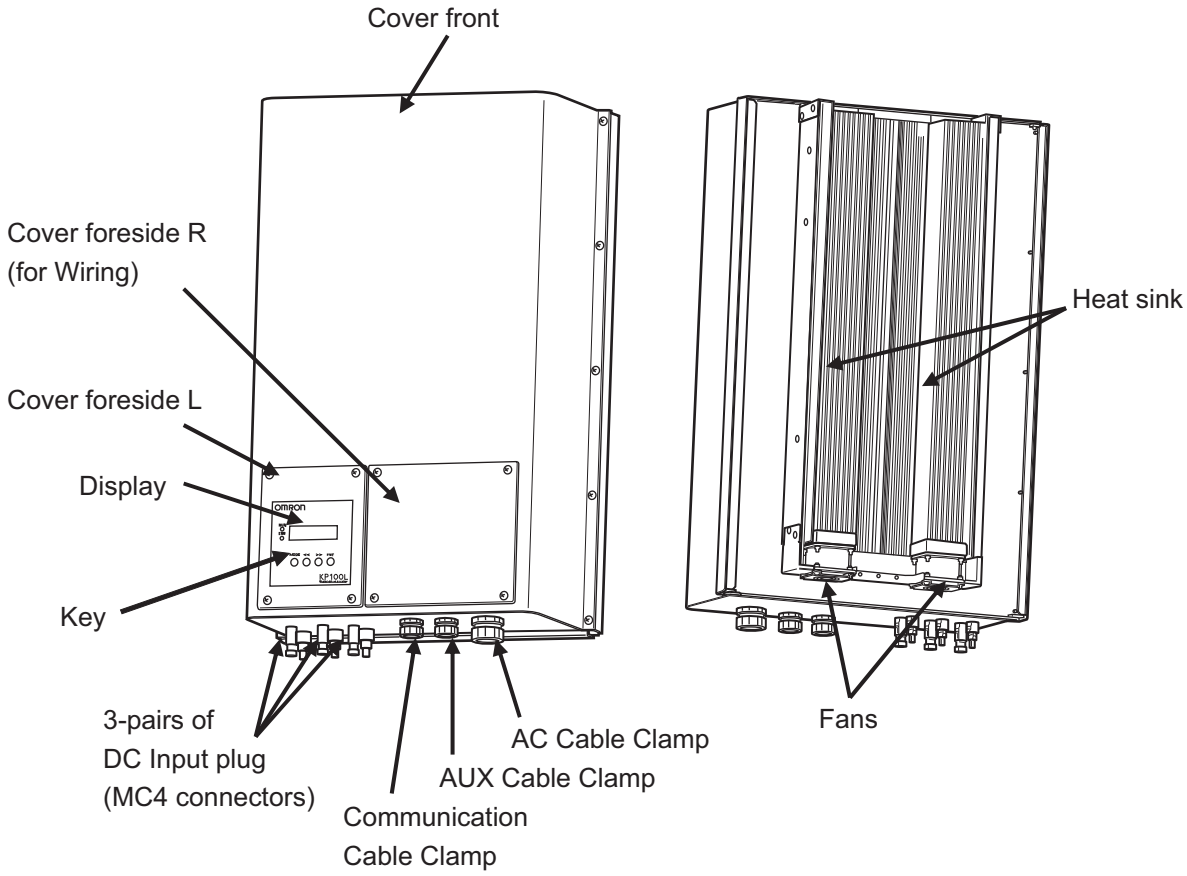
The KP100L has the photo-coupler for input signals of the table below. Refer to section "3.5 Mode Selection Display" for the setting of the input signal.

Name	Type of contact	Specifications
AUX_IN	Photo-Coupler	10mA Use 24 VDC to use AUX_IN. Minimum ON time : 100ms Leakage current at OFF status < 0.1mA Residual voltage at ON status < 2.0V Capacity of external switch > 20mA

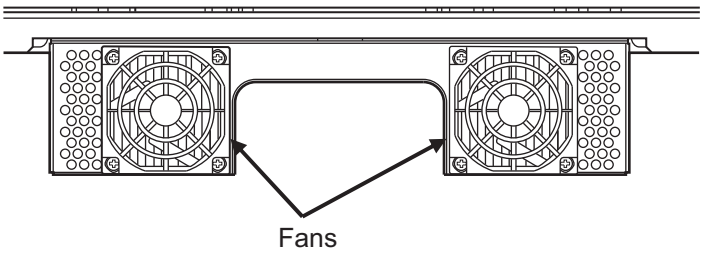
[Example when you use AUX_IN]



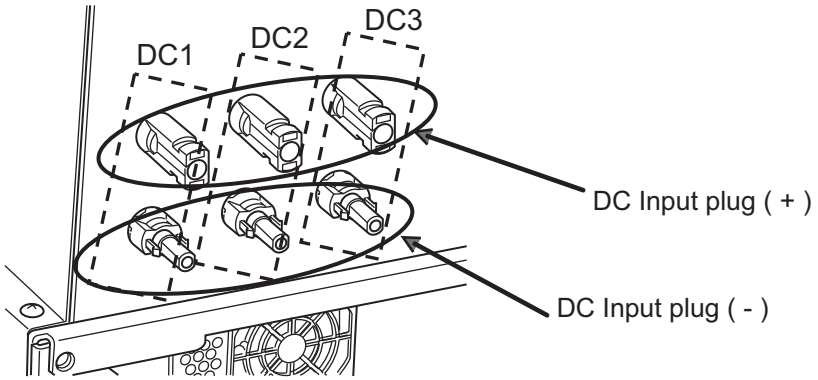
1.3 Appearance and Names of Parts



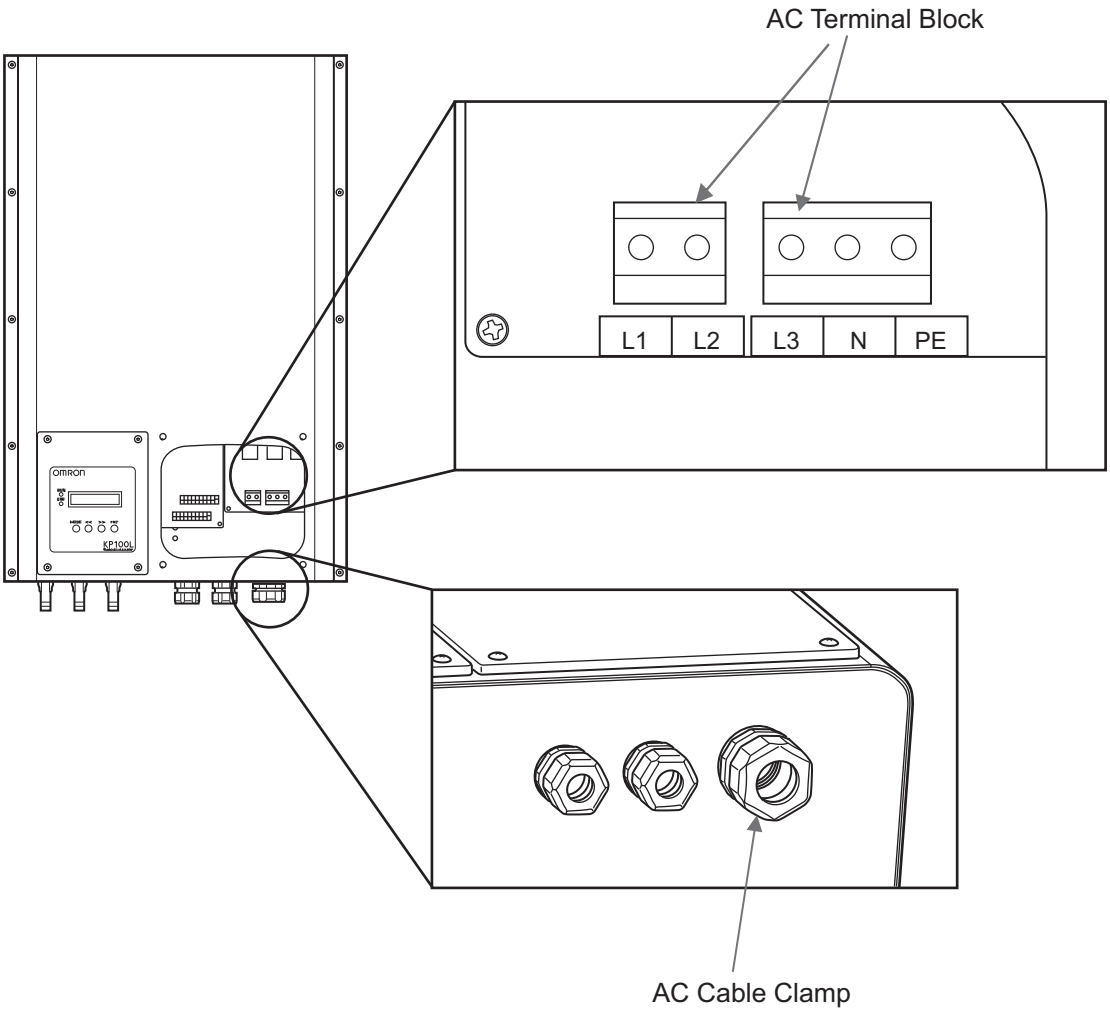
(1) Fan



(2) 3-pairs of DC input plug (standard MC4 connectors):
Each input pair consists of positive and negative plug, Refer to section "2.4 Wiring".

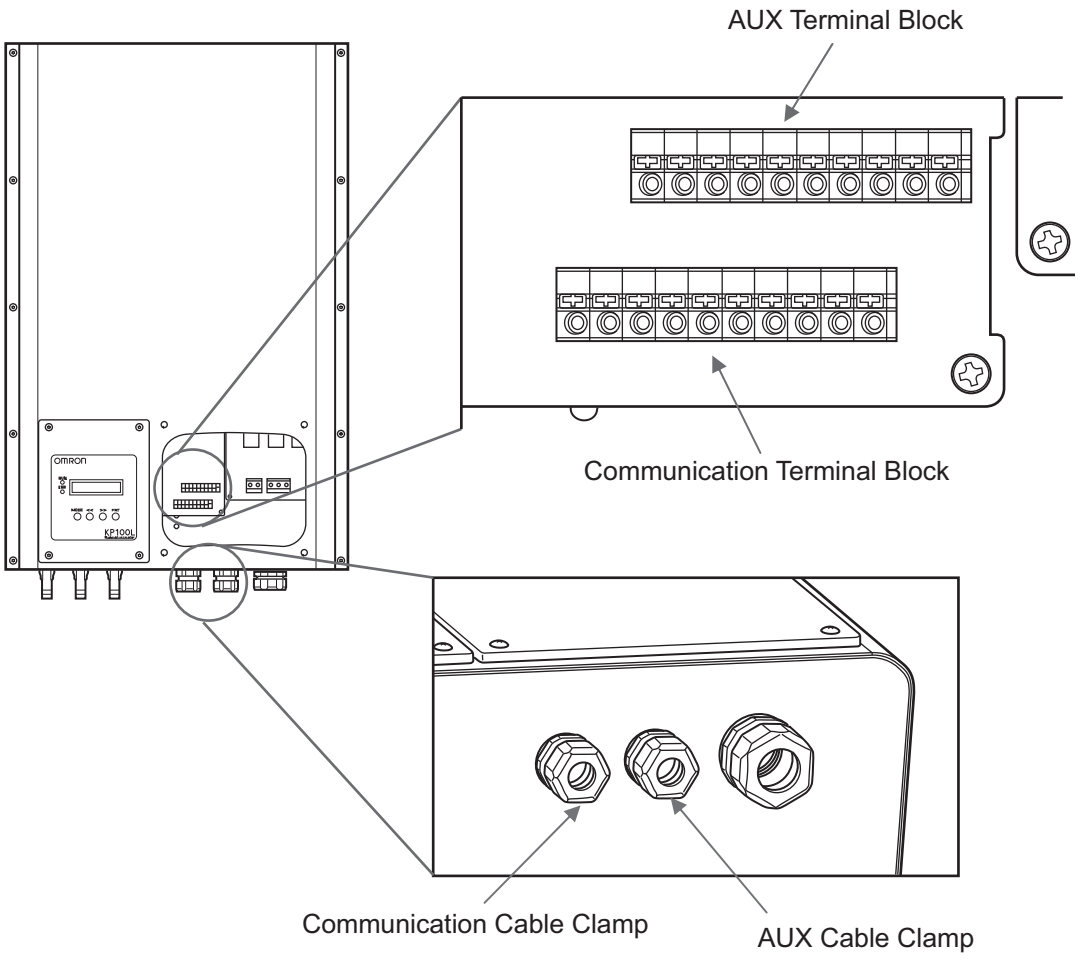


(3) AC Output:
Delivering AC to the grid

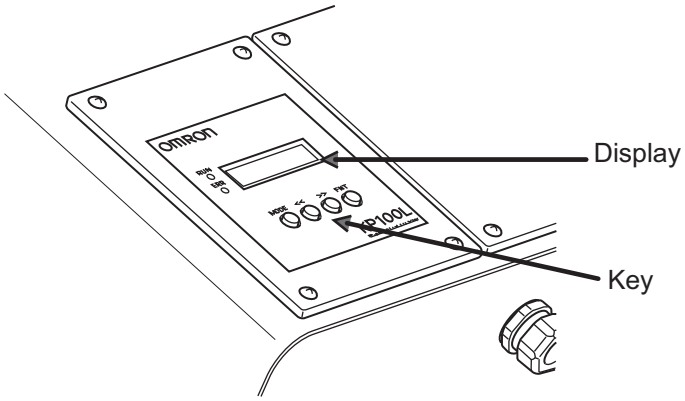


(4) AUX Interface
AUX Interface has the two relay output and the one photo coupler input.

(5) RS-232C or RS-485 Communication Interface:
The interface allows the communication with computer via RS-232C or RS-485.



(6) Display and Key



2

Design

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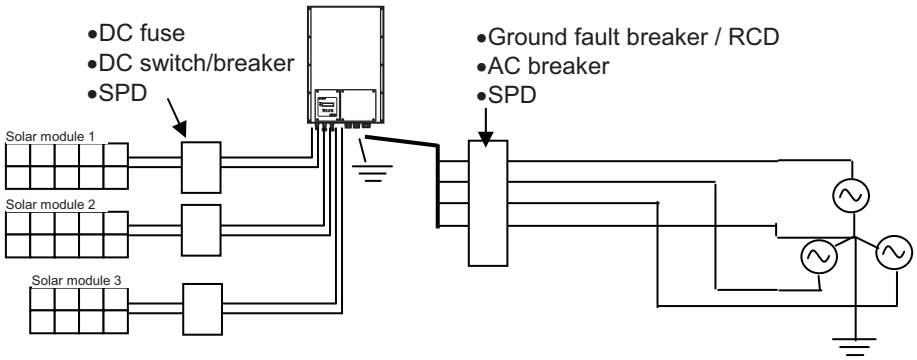
2.1 Typical System Configuration

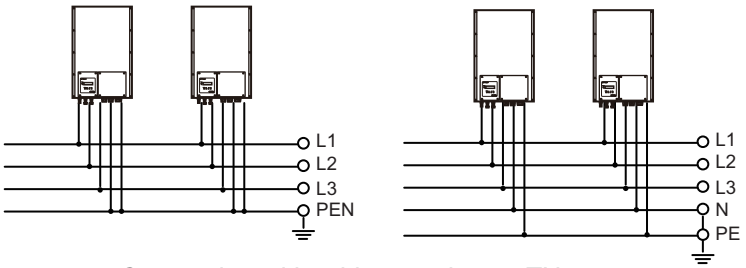
The figure below shows the typical system configuration of the KP100L.

The equipments in AC and DC side are used depends on the design of the customer.

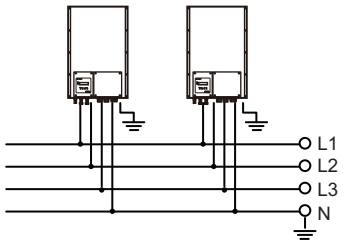


■Applicable grid network

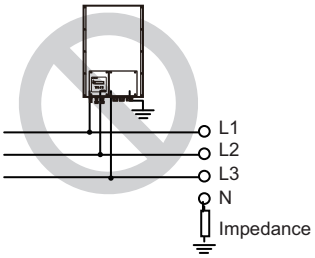
The KP100L is designed to operate with grid network system type TT, TN as shown in the figure below. If the KP100L is connected to the different type of grid network such as IT, it might fail.



Connection with grid network type TN

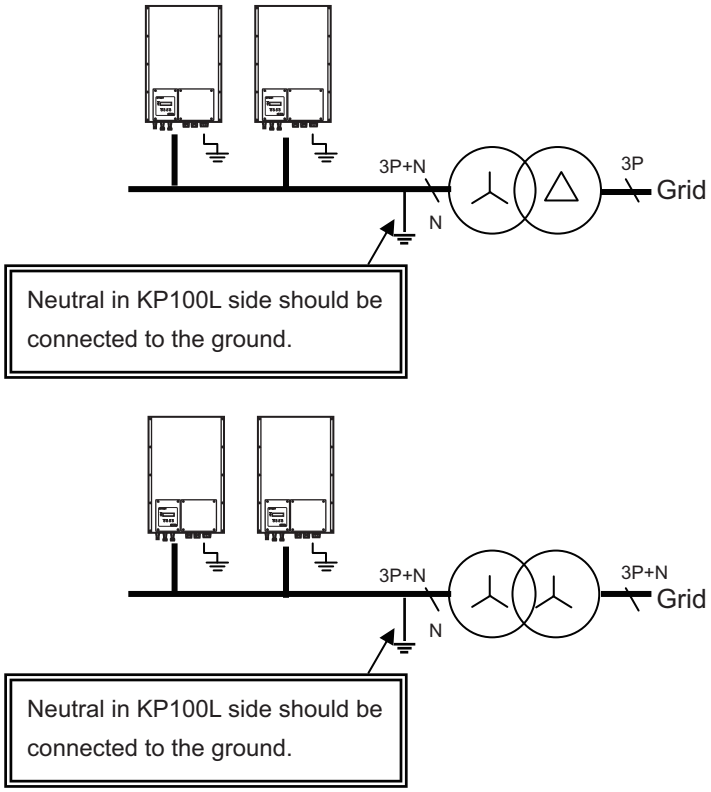


Connection with grid network type TT



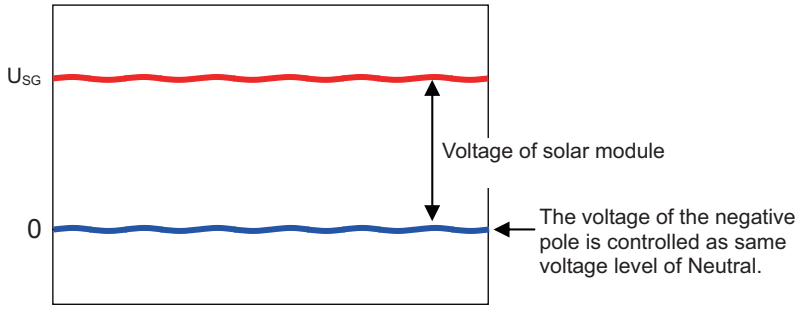
Connection with grid network type IT

The KP100L is designed with grid network system type TT, TN. Then If you use transformer, connect the Neutral to the ground as shown in the figure below.

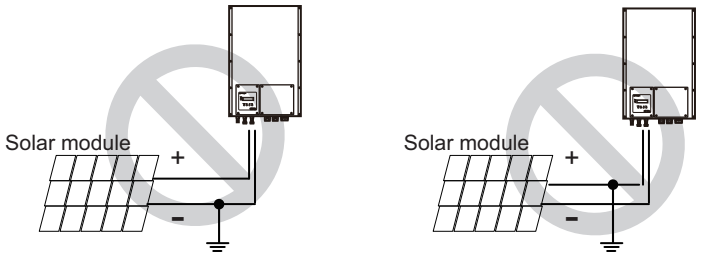


■Applicable solar module

The KP100L is designed to control the voltage of negative pole on solar module as same voltage level as Neutral of grid as shown in figure below. This can be achieved by new inverter circuit (ZCC).
As a result, the voltage of negative pole on solar module is approx. zero. According to this function, you can use the solar module which does not allow negative voltage on solar module.



Do not use the solar module that require earthing of negative or positive pole. Otherwise, the failure might occur.



Applicable type of solar module is shown in the table below.

Solar module manufacture requirement	Type of solar module	Applicable or not
(1) No requirement	Conventional silicon-based solar modules	KP100L can be used.
(2) No negative voltages on solar module	Some thin-film or silicon modules	KP100L can not be used.(*1)
(3) Earthing of negative pole on solar module	Some thin-film or silicon modules	KP100L can not be used.
(4) No positive voltages on solar module	Specific solar module	KP100L can not be used.
(5) Earthing of positive pole on solar module	Specific solar module	KP100L can not be used.

***1 Note: Aug,2012**
KP100L have the compatibility with thin-film module only approved by Omron and thin film maker.
(Notice)
Please confirm the compatible thin-film module by contacting Omron before using thin-film module.

2.2 Application information

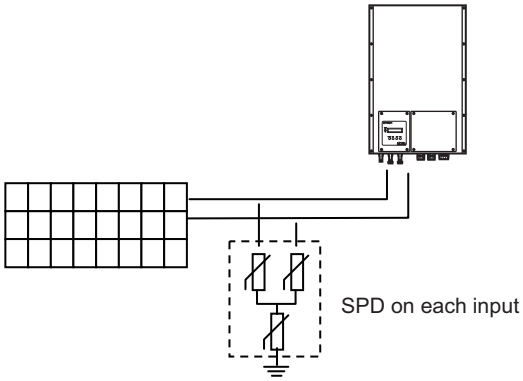
■DC side

DC switch / breaker

DC switch / circuit breaker is an obligatory prerequisite stipulated by DIN VDE 0100-712, the installation standard for PV systems in Germany. For safety point of view during working on an electrical device, it is necessary to disconnect from the energy supply. DC circuit breaker between the PV modules and the inverter is used. Select DC circuit breaker with rate current is larger than designed PV short circuit current on each DC input.

SPD (Surge Protective Device) in DC side

SPD (Surge protective device) is used to protect the inverter against lightening surge voltage.



Example of SPD
- Class II
- PV voltage 1000 VDC
- Nominal discharge current (8/20us) I_n:20 kA
- Maximum discharge current (8/20us)I_{max}:40 kA
- Protection revel: 4 kV

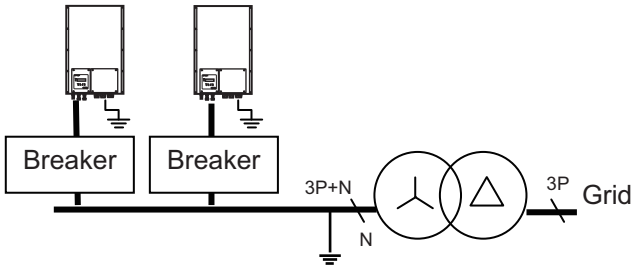
This is just example. Contact company of protection device for selection.

■AC Grid side

AC breaker

For protection of AC over current, use a 20 A trip breaker with B or C or D trip characteristics.

If you use the transformer, install the breaker between the transformer and the KP100L as shown in the figure below.



Ground fault breaker / RCD (Residual Current Device)

For KP100L, the use of RCDs type B is not indispensable and RCDs type A can be used.

IEC712.413.1.1.2 describes about Residual Current Devices (RCDs) as follows:

> **712.413.1.1.1.2** Where an electrical installation includes a PV power supply system without at least simple separation between the AC side and the DC side, an RCD installed to provide fault protection by automatic disconnection of supply shall be type B according to IEC 60755, amendment 2.
>
> Where the PV inverter by construction is not able to feed DC fault currents into the electrical installation, an RCD of type B according to IEC 60755 amendment 2 is not required.

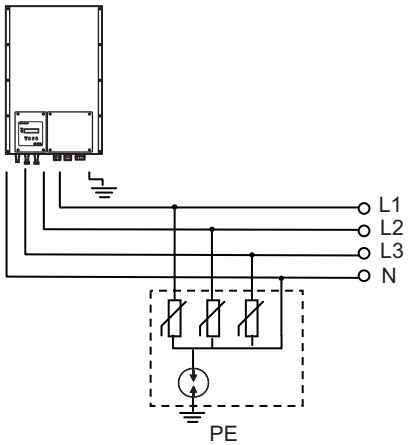
KP100L has built-in fault current protection function required in Germany standard of VDE V 0126-1-1:2006-02, so DC residual current can be detected and cannot flow to the grid.

Notice of selecting RCD

- The use of RCDs 300mA type A for each unit is recommended.
- I∆n(rated residual operating current of RCD) has to be selected according to the local regulations about the system configuration, and residual current caused by capacitive characteristic of cable and PV modules.
- In the systems which DC current detection of I∆n<30mA is required, type B has to be used.
- KP100L has built-in fault current protection function but residual current is not zero, so the more KP100L installed units, the much residual current flows in the grid. When multiple KP100L are installed, downstream RCD(for KP100L) and upstream RCD has to be determined by consideration of increasing residual current.
- Ultimately, the selection of RCD depends on System Integrators' judgment. OMRON provide this information for selection of RCDs, but we are not responsible for the selection of RCD.

SPD in Grid side

SPD is used to protect the inverter against lightening surge voltage in AC line.



Example of SPD

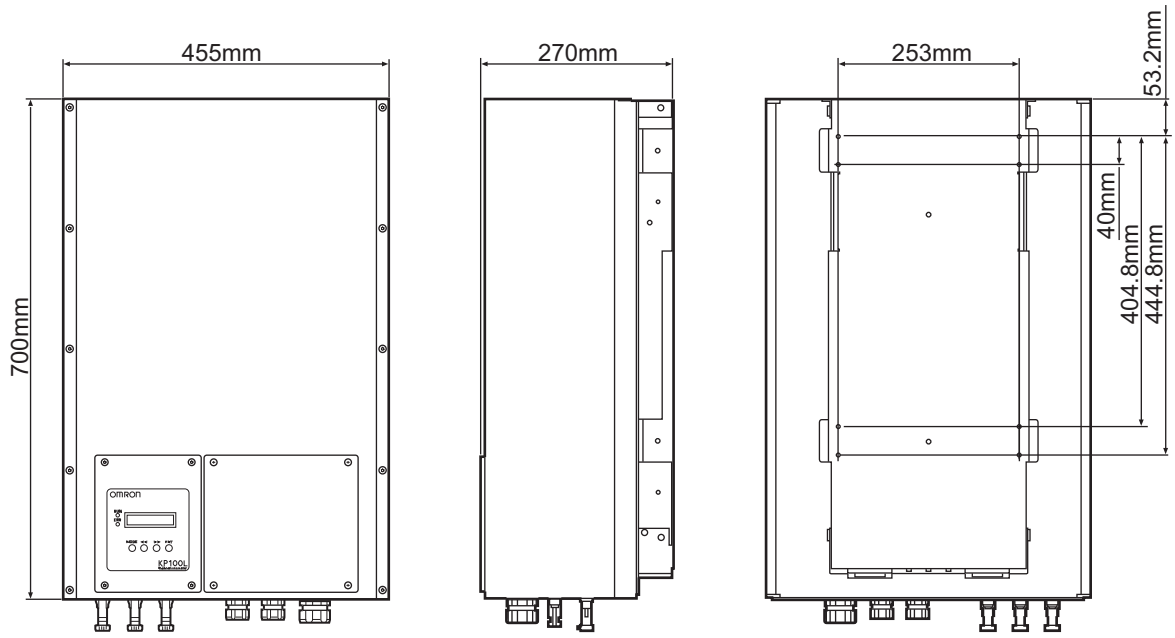
- Class II
- Nominal voltage 230/400 VAC
- Nominal discharge current (8/20us) I_n:20 kA
- Maximum discharge current (8/20us)I_{max}:40 kA
- Protection revel: 1.5 kV

This is just example. Contact company of protection device for selection.

2.3 Installation

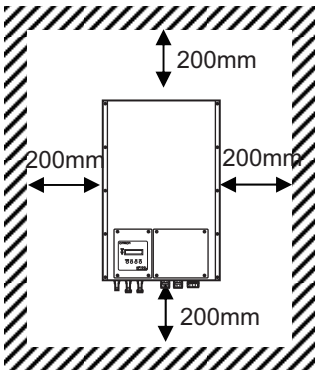
■ Dimensional Drawing

Mounting Dimensions

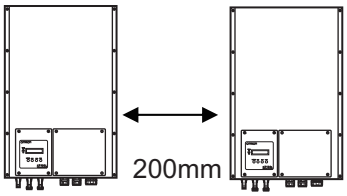


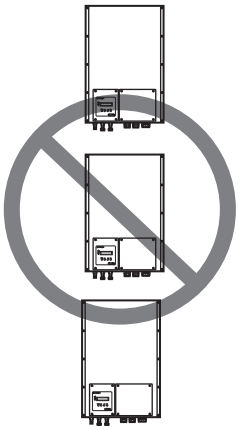
Installation Environment

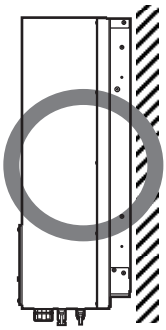
- Do not install the product on ocean-going vessels or in places near the seacoast that are subject to saltwater spray.
- When you install outdoors, be sure to provide an awning or eave of some kind to prevent direct sunlight or rain from striking the Unit.
- Leave specific space as shown in the figure below between the KP100L and the ceiling or eave, the floor or ground, and wall when you install the KP100L.



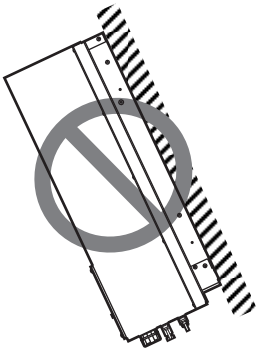
- When you install multiple Inverters, leave a space of 200mm the minimum to the side of the Inverter. Do not install a KP100L directly above another KP100L or any other product or installation generating considerable heat.
- Install KP100L vertically. Do not install KP100L horizontally or in a position where it is tilted forward or backward.



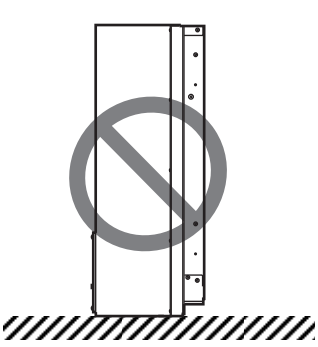


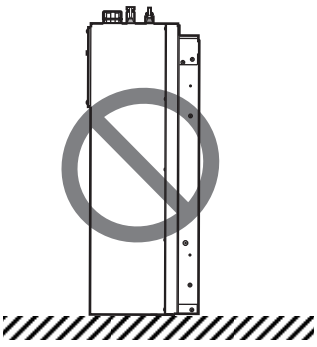


Mount Inverter Straight



Never mount tilted to front



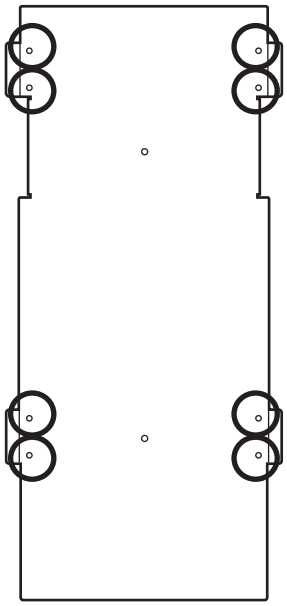


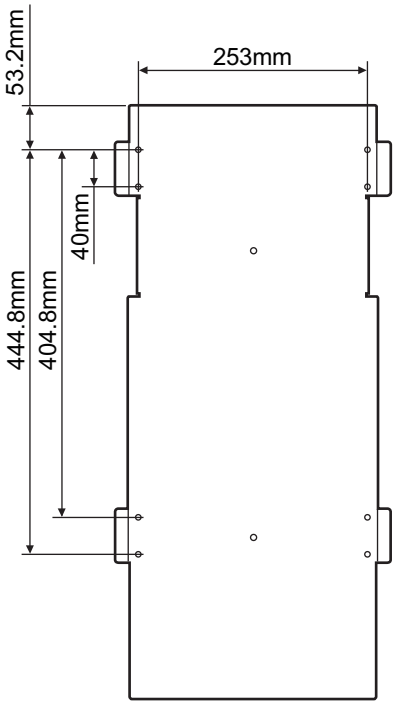
Never use in tower orientation

■Installation

(1) Set up "Mounting base plate" in the place where the weight (41.5kg) of KP100L can be endured. The installation location should endure the torque of 176N·m with each installation screw.
Use the reinforced board when strength of the wall is insufficient.
Please prepare the board to reinforce it .

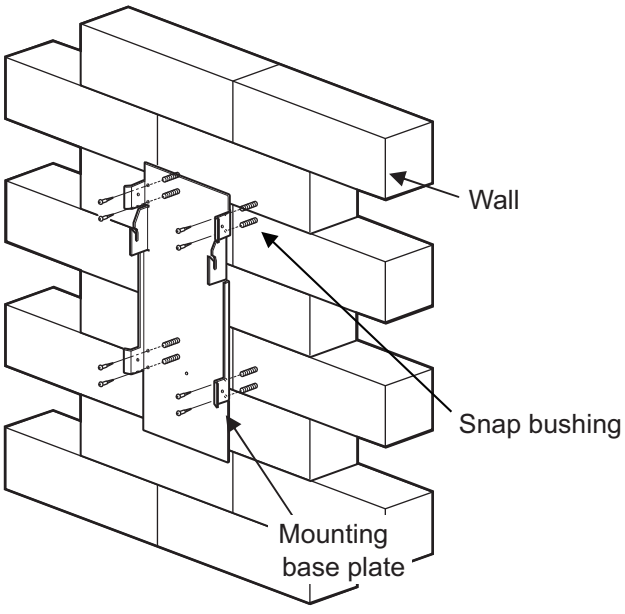
(2) Mark the positions of the 8 outer mounting holes onto the wall with the mounting base plate.



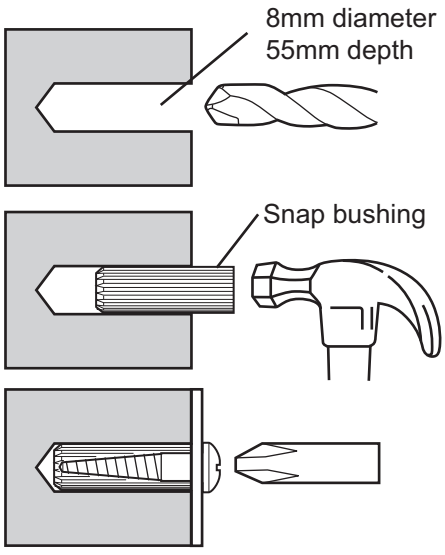


(3) Drill the 8 marked holes in the wall, and then drive the 8 Snap Bushings by the hammer into the wall, when the wall is a hard wall like concrete.

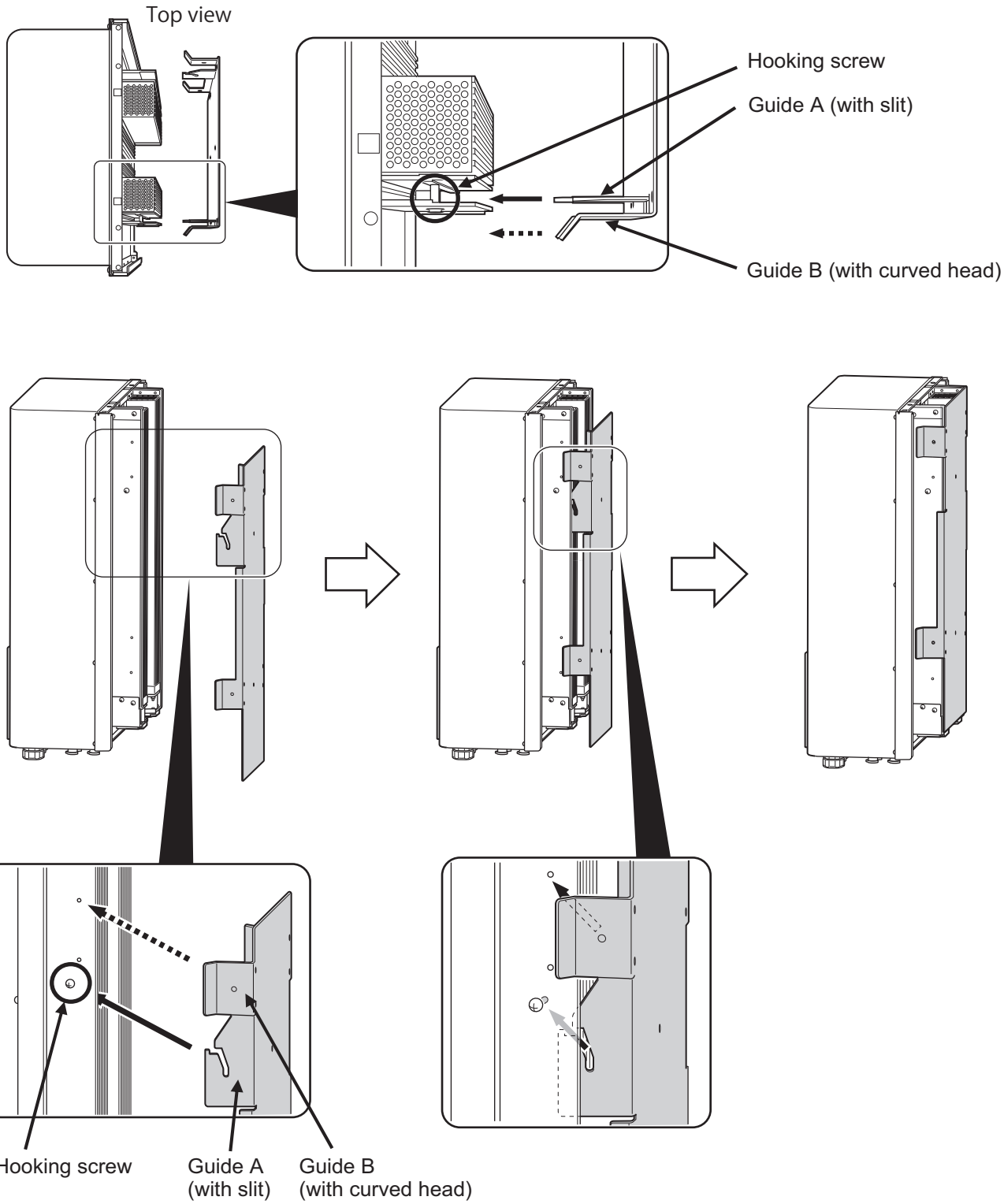
(4) Fix the mounting base plate to the wall by using 8 mounting screws of the attachment.



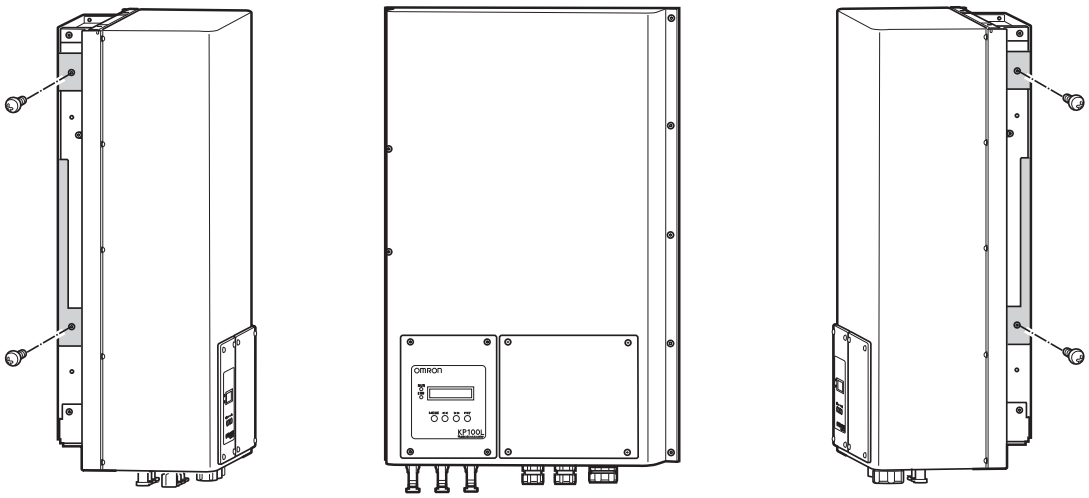
Use Snap Bushings when the wall is a hard wall like concrete



(5) Lift the inverter by two persons.
Hang the inverter (A) by inserting the “Hooking screw” to the slit of the “Guide A”.
(B) and by setting the “Guide B” outside of the heat sink.



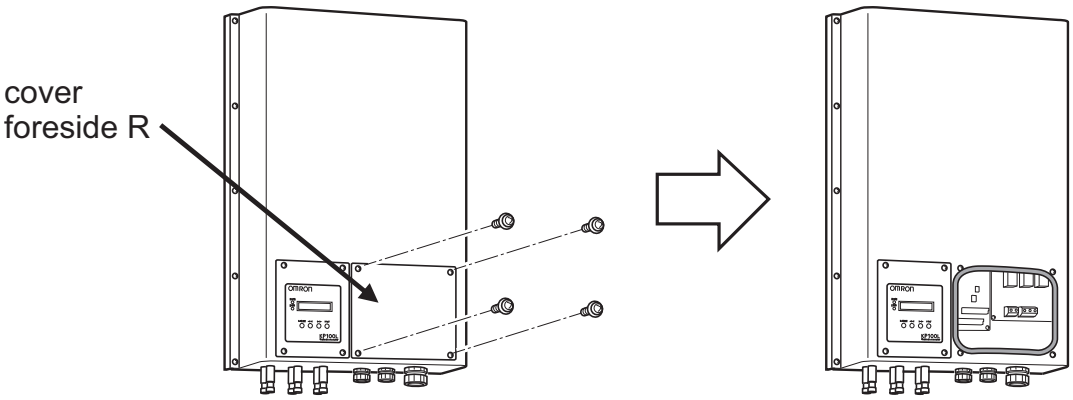
(6) Fix the heat sink and the mounting base plate by using bundled M4X12 with plane washer and spring washer in 4 points. (Tightening torque: 1.5 to1.7 N·m)



2.4 Wiring

■Remove the cover foreside R.

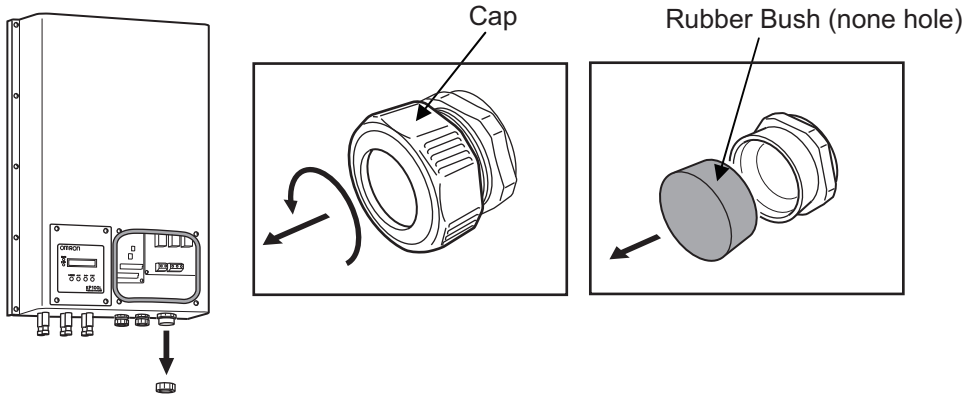
Remove the 4 screws, and the cover foreside R by a TX20 Torx screwdriver.



■Connecting the AC Cable

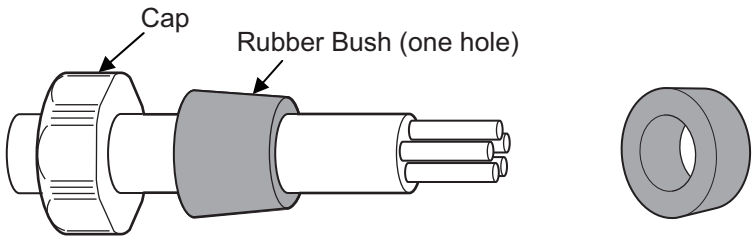
Connect the AC cable to the KP100L as follow steps

(1) Remove the cap of the AC cable clamp, and take the rubber bush (None hole) out.



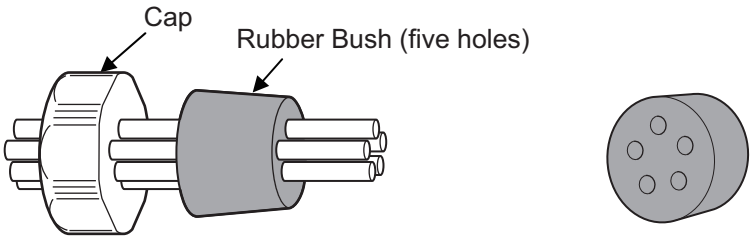
(2) Pass the AC cable through the cap and the rubber bush of the cable clamp.
Rubber bush (one hole type and five hole type) is included.

(2)-1In the case of you use the rubber bush of the one hole type
The rubber bush of one hole is used for connection with multiple-cable.



(2)-2 In the case of you use the rubber bush of the five holes type

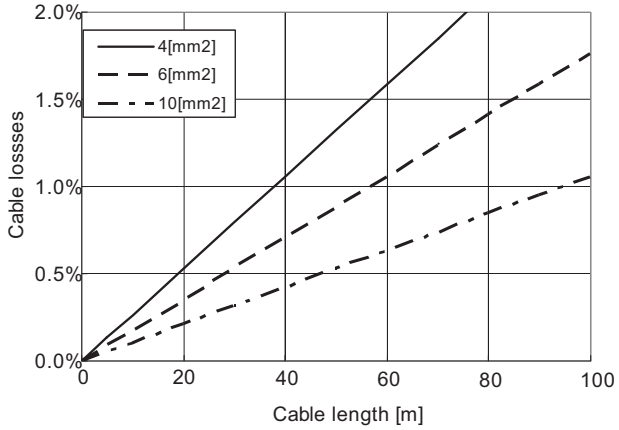
The rubber bush of five holes is used for connection with five individual cables.



(2)-3 Use the cable and the wire in the table below

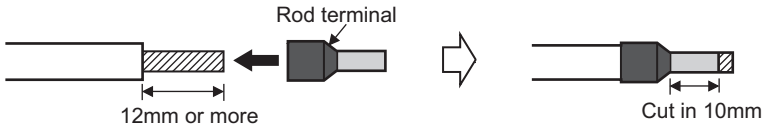
	Diameter of cable	Cross-sectional area of wire
The rubber bush for one hole	φ18.5 to 20.5mm	4mm^2 / AWG12 or more
The rubber bush for five holes	φ3.5 to 4.0mm	4mm^2 / AWG12

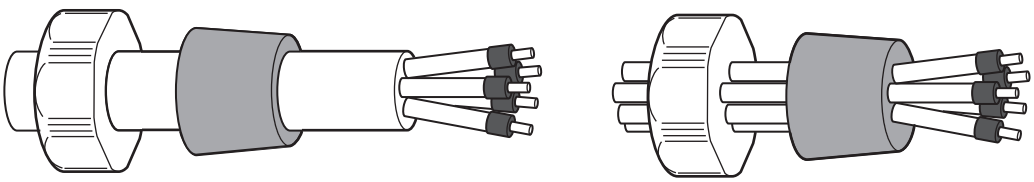
Don't use cables that the loss is more than 1% of nominal power of the inverter.
Refer to the figure below to check possible cable lengths for the different cross-sectional area. The figure shows lengths of cable with copper conductor. When you use cable with conductor of different material, calculate applicable cable lengths



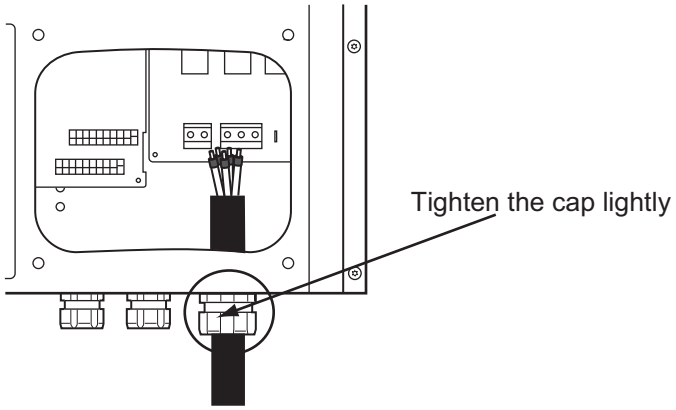
(3) Use the special Rod terminal and crimping pliers for AC wiring like the picture below when connected with KP100L.

Cross-sectional area of wire	Rod terminal (Phoenix Contact)	crimping pliers (Phoenix Contact)
4 mm^2	AI 4-10 GY	CRIMFFOX 6, CRIMPFOX 10s
6mm^2	AI 6-12 YE	CRIMFFOX 6, CRIMPFOX 10s
10 mm^2	AI 10-12 RD	CRIMPFOX 10s

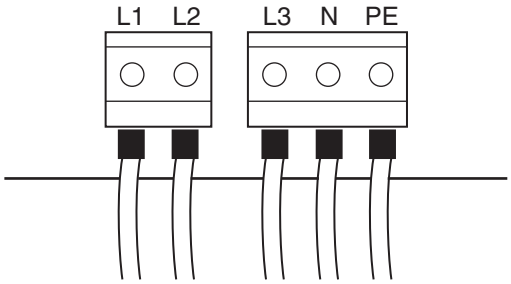




(4) Pass the AC cable through the hole of the product. Set the rubber bush in the main body of the cable clamp, and tighten the cap lightly.



(5) Insert wire with Rod terminal in the interior of AC terminal block, and tighten by a flathead screwdriver. (Tightening torque :1.2 to 1.5 N·m)

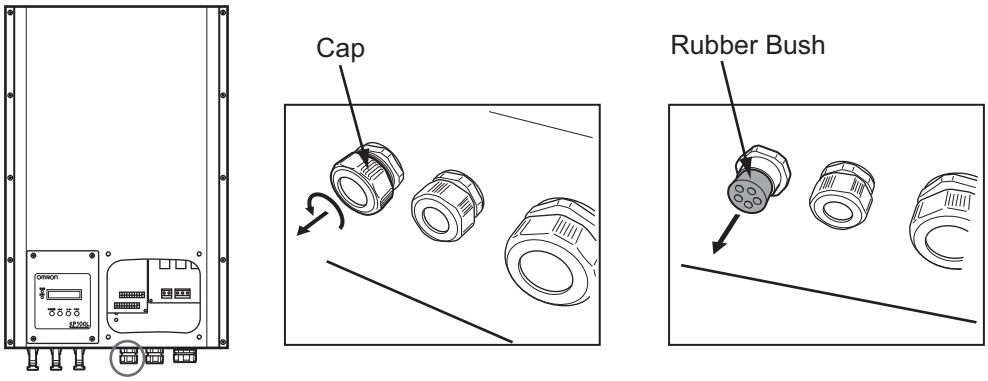


(6) Tighten the cap of the cable clamp surely.
When tightening the cable clamp is insufficient, the effect of the waterproof is not achieved.

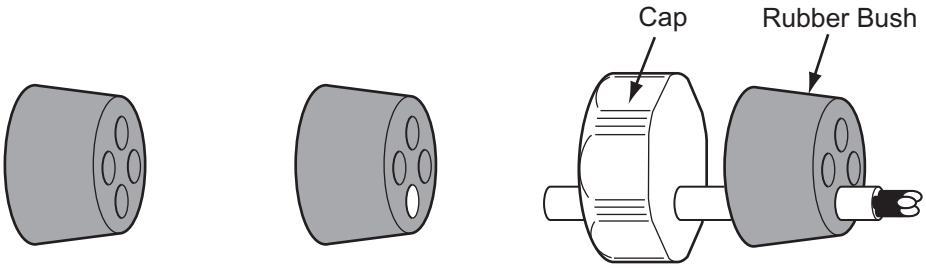
■Connecting the Communication Cable

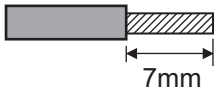
Wiring for the communications cable to the KP100L as follow steps

(1) Remove the cap of communications cable clamp, and take the rubber bush out.



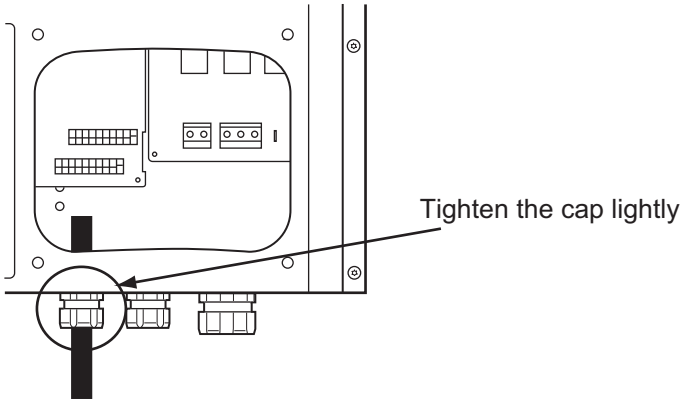
(2) Puncture only the necessary parts of the rubber bush taken out with a tool like gimlet, and pass wiring. Use the cable and the wire in the table below.



Diameter of cable	φ4.0mm
Diameter of wire	solid wire / φ0.4-1.2 (AWG26-16)
Length in which the insulating coating of the cable is peeled off and taken	 7mm

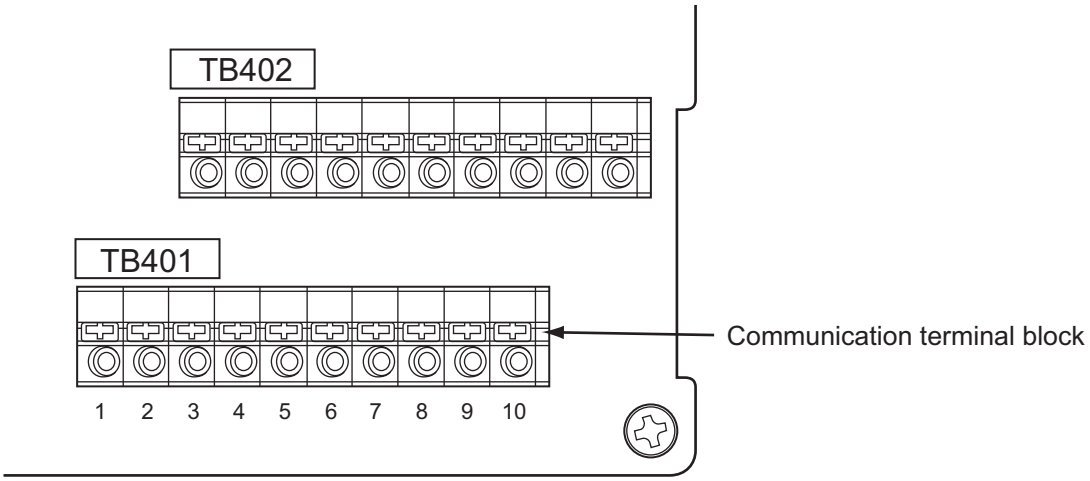
Two spare rubber bush are bundled. Use bundled rubber bush when you make a mistake in the punctured processing.

(3) Pass the communication cable through the hole of the product. Set the rubber bush in the main body of the cable clamp, and tighten the cap lightly.



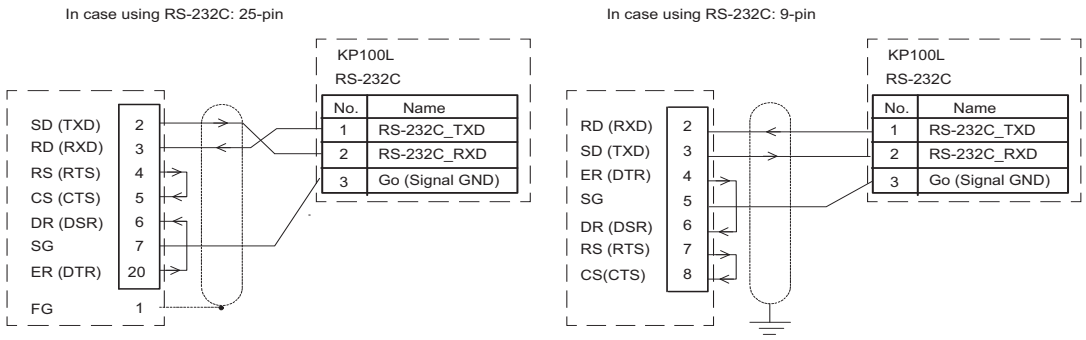
(4) KP100L has 2 kinds of communications (RS-232C, RS-485), and the following tables show each wiring step. The PIN arrangement of "Communication terminal block" is shown below.

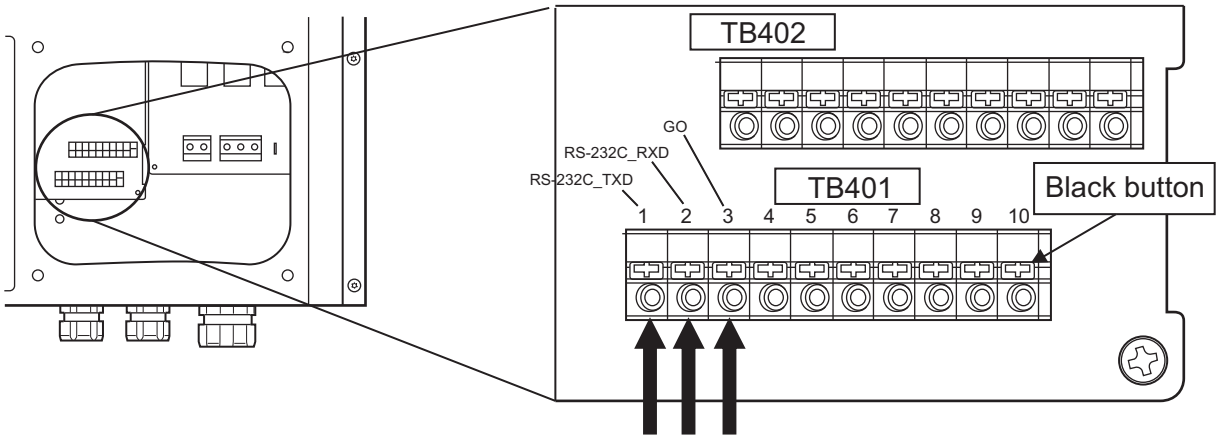
No	Name	Note
1	RS-232C_TXD	-
2	RS-232C_RXD	-
3	GO (Signal GND)	-
4	RS-485_DB(+)	-
5	RS-485_DA(-)	-
6	GO (Signal GND)	GO is internally connected with Terminal No.3.
7	RS-485_DB(+)	RS-485_DB (+) is internally connected with Terminal No.4.
8	RS-485_DA(-)	RS-485_DA (-) is internally connected with Terminal No.5.
9	RS-485_END1	When using RS-485 and termination is required, Terminal No.9, and 10 are connected.
10	RS-485_END2	When using RS-485 and termination is required, Terminal No.9, and 10 are connected.



(5)-1 RS-232C

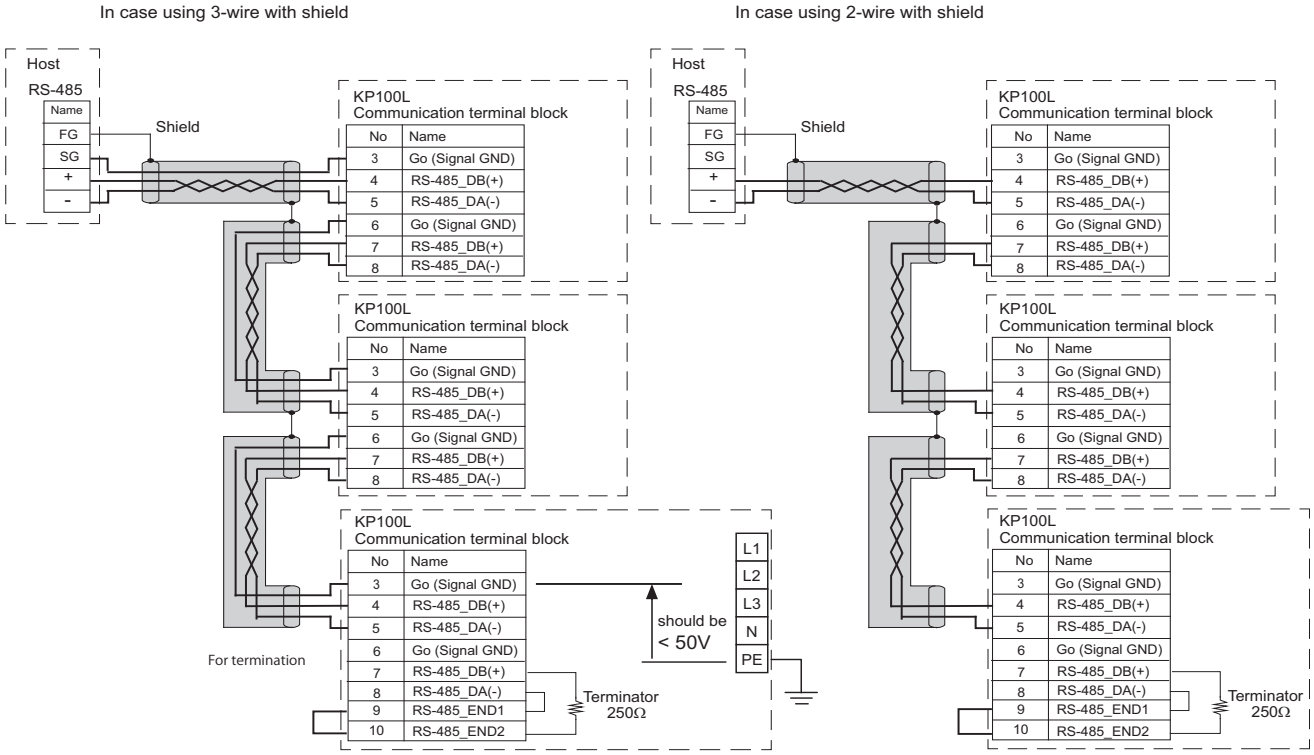
Connect shielded twisted-pair cable to 1: RS-232C_TXD, 2 : RS-232C_RXD, and 3 : GO of communication terminal block (TB401). When you connect the wire, insert the wire while pushing the black button of TB401 and release the button.
*Note: Avoid the wrong wiring of the signal wire, and the catch of the insulating coating.





(5)-2 RS-485

Wire RS-485 terminal between host controller and KP100L as shown below.
RS-485 driver sends data by modulating the differential voltage. The receiver must sense and decode the differential. There are limits to the voltages the transmitters and receivers can work with. If there are different ground potential between host and KP100L, one of the devices might operate outside the specified voltage range.
To ensure communication with same ground potential, use 3-wire cable (twisted-pair) and connect signal ground between host and KP100L with one of 3-wire. Shield of the wire can reduce effect of common mode noise.
When you don't use 3-wire and don't connect signal ground, whether or not you succeed RS-485 communication depends on the difference of ground potential between host and KP100L. If differential voltage of RS-485 is within the operation voltage range of receiver IC, you can use RS-485 communication. Note that if you don't connect signal ground, resistance against noise become lower.

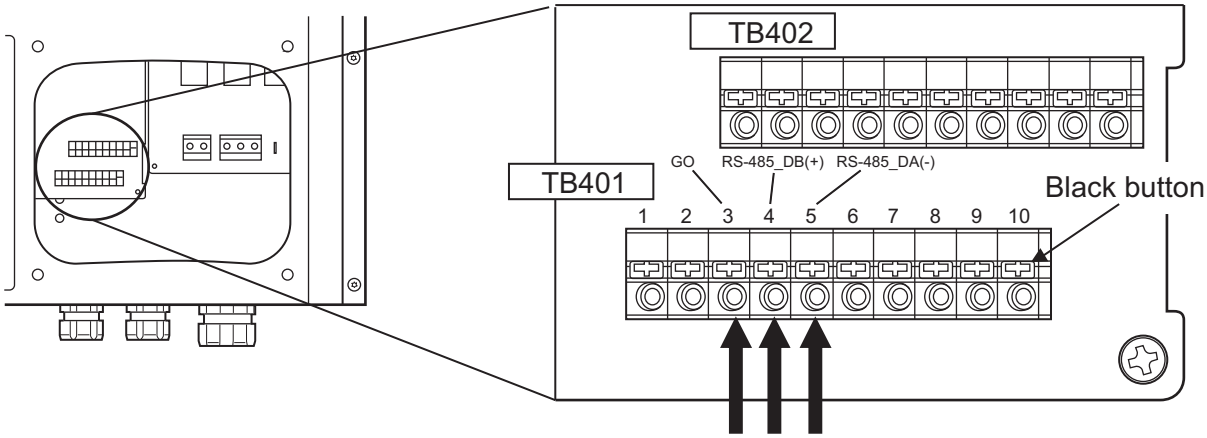


Keep the voltage between GO of Communication terminal block and PE.is less than 50V.

(5)-2-1 Wiring for RS-485

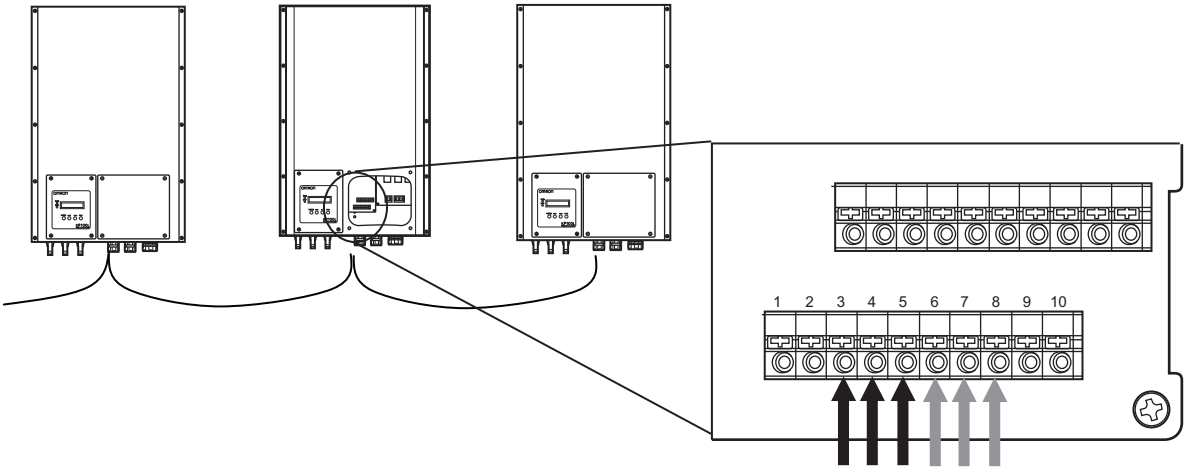
Connect the wire to 3: GO, 4: RS-485_DB(+), 5: RS-485_DA(-) of communication terminal block(TB401). When you connect the wire, insert the wire while you push the black button of TB401 and release the button.

*Note: Avoid the wrong wiring of the signal wire, and the catch of the insulating coating.



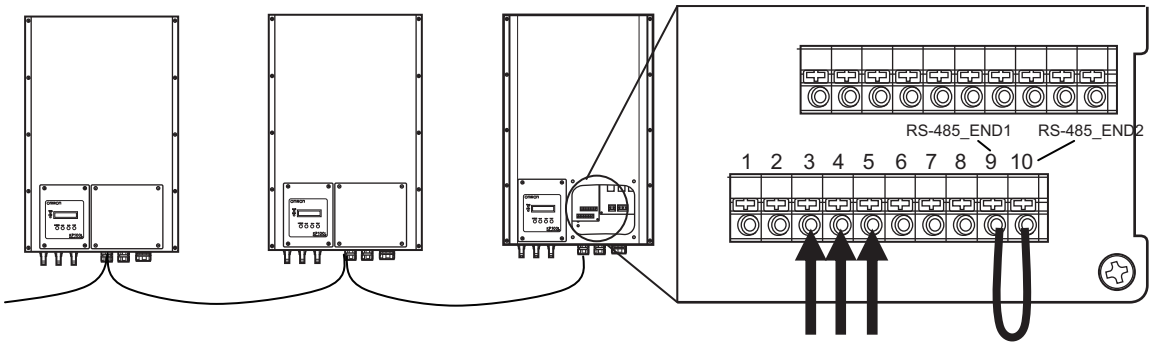
(5)-2-2 Wiring when connecting 2 or more products

Connect the wire to 3: GO, 4: RS-485_DB(+) and 5: RS-485_DA(-) of the communication terminal block(TB401). Connect the other wire to 6: GO, 7: RS-485_DB(+) and 8: RS-485_DA(-).



(5)-2-3 Terminal processing of wiring when connecting 2 or more products

Connect the other wire to 9: RS-485_END1 and 10: RS-485_END2. Be short-circuited.



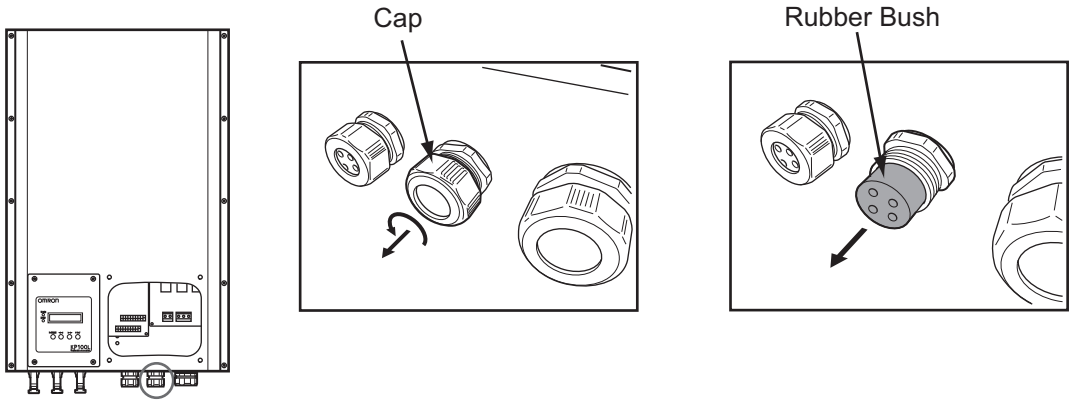
(6) Tighten the cap of the cable clamp surely.

If the tightening is insufficient, the effect of the waterproof is not achieved.

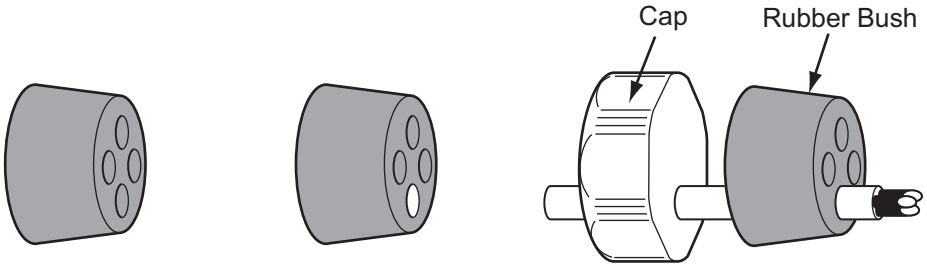
■Connecting the AUX Cable

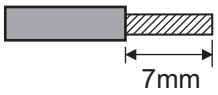
Wiring for the AUX cable to the KP100L as follow steps

(1) Remove the cap of the AUX cable clamp, and take the rubber bush out.



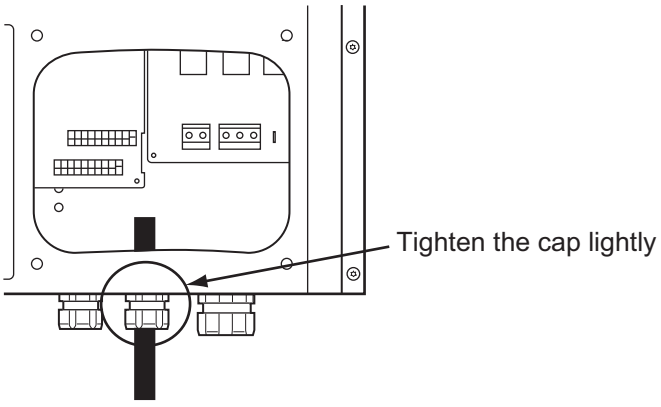
(2) Puncture only the necessary parts of the rubber bush taken out with a tool like gimlet, and pass wiring. Use the cable and the wire in the table below.



Diameter of cable	φ4.0mm
Diameter of wire	solid wire / φ0.4-1.2 (AWG26-16)
Length in which the insulating coating of the cable is peeled off and taken	 7mm

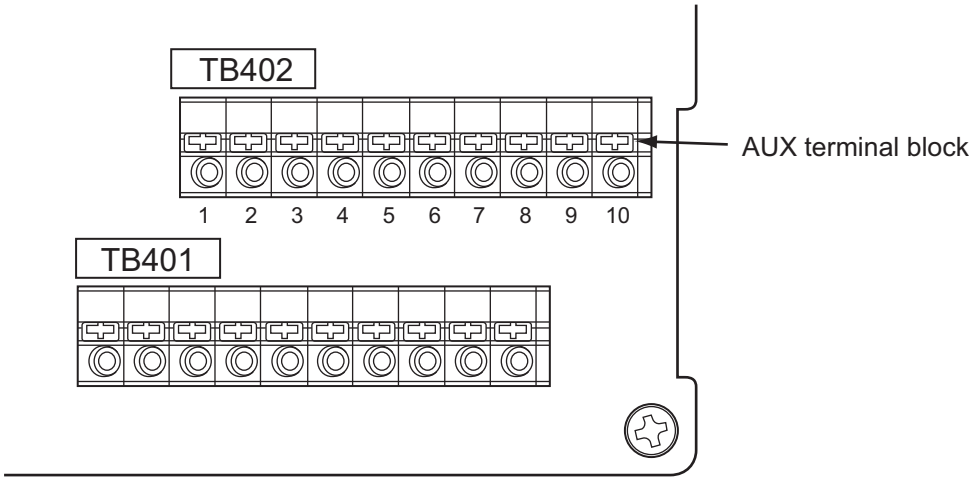
Two spare rubber bush are bundled. Use bundled rubber bush when you make a mistake in the punctured processing.

(3) Pass the AUX cable through the hole of the product. Set the Rubber Bush in the main body of the cable clamp, and tighten the cap lightly.



(4) KP100L has one input signal and two output signal, and shows each wiring steps in the follow. The PIN arrangement of "AUX terminal block" is shown below.

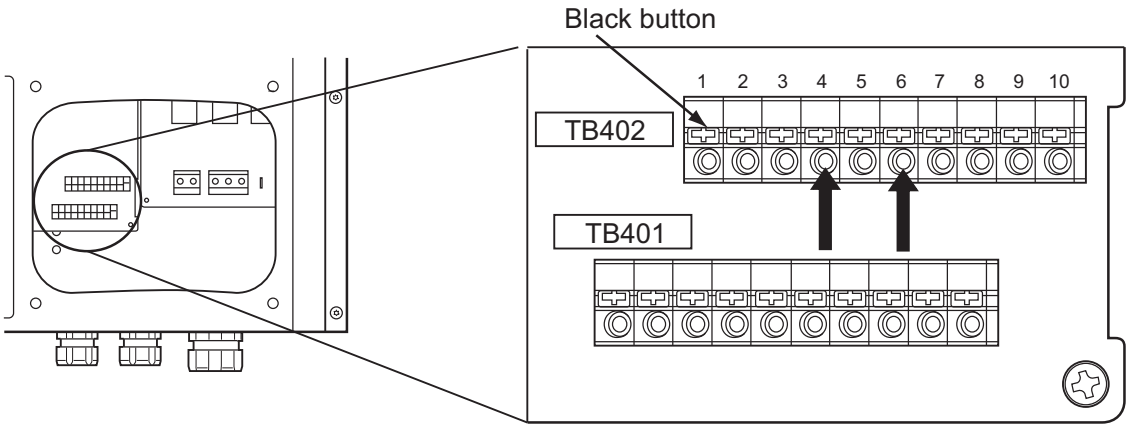
No	Name	Note
1	AUX_IN+	Photo-coupler input +. Refer to section "1.2 Functions"
2	AUX_IN-	Photo-coupler input -. Refer to section "1.2 Functions"
3	NC	-
4	AUX_OUT1+	Relay out put. Refer to section "1.2 Functions"
5	AUX_OUT1+	AUX_OUT1+ is connected Terminal No.4 and internally.
6	AUX_OUT1-	Relay out put. Refer to section "1.2 Functions"
7	AUX_OUT1-	AUX_OUT1- is connected Terminal No.6 and internally.
8	NC	-
9	AUX_OUT2+	Relay out put. Refer to section "1.2 Functions"
10	AUX_OUT2-	Relay out put. Refer to section "1.2 Functions"



(5)-1-1 AUX_OUT1

Connect the wire to 4 : AUX_OUT1+ and 6 : AUX_OUT1- of AUX terminal block(TB402). When you connect the wire, insert the wire while you push the black button of TB402 and release the button.

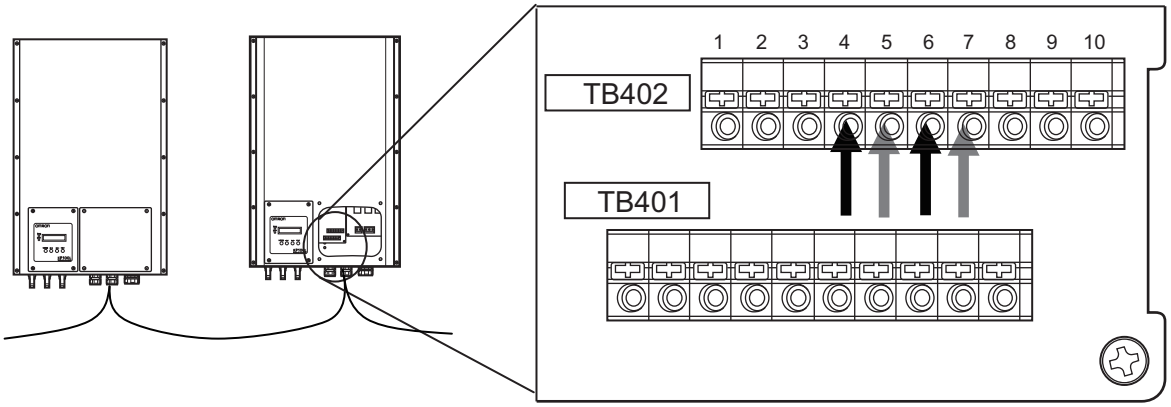
*Note: Note the wrong wiring of the signal wire, and the catch of the insulating coating.



(5)-1-2 Wiring when connecting 2 or more products (AUX_OUT1)

Connect the wire to 4 : AUX_OUT1+ and 6 : AUX_OUT1- of AUX terminal block(TB402).

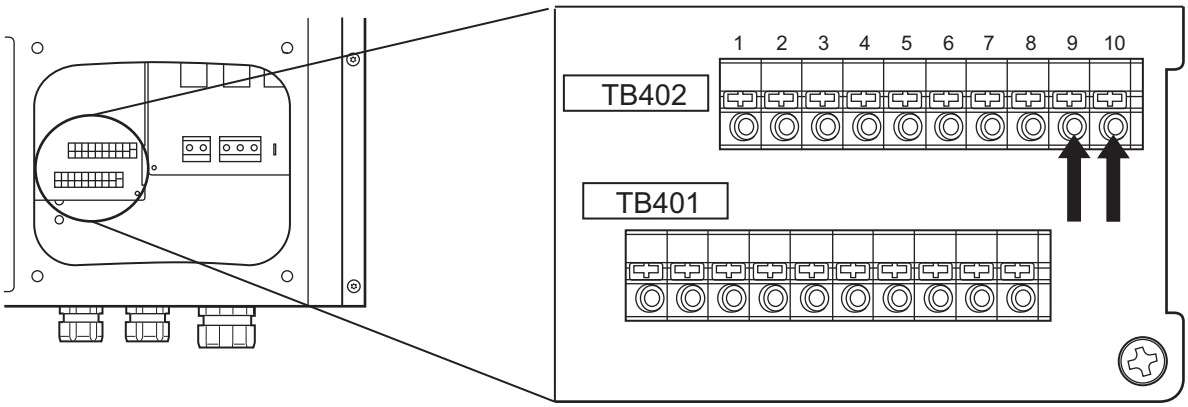
Connect the other wire to 5 : AUX_OUT1+ and 7 : AUX_OUT1-.



(5)-2 AUX_OUT2

Connect the wire to 9 : AUX_OUT2+ and 10 : AUX_OUT2- of AUX terminal block(TB402). When you connect the wire, insert the wire while you push the black button of TB402 and release the button.

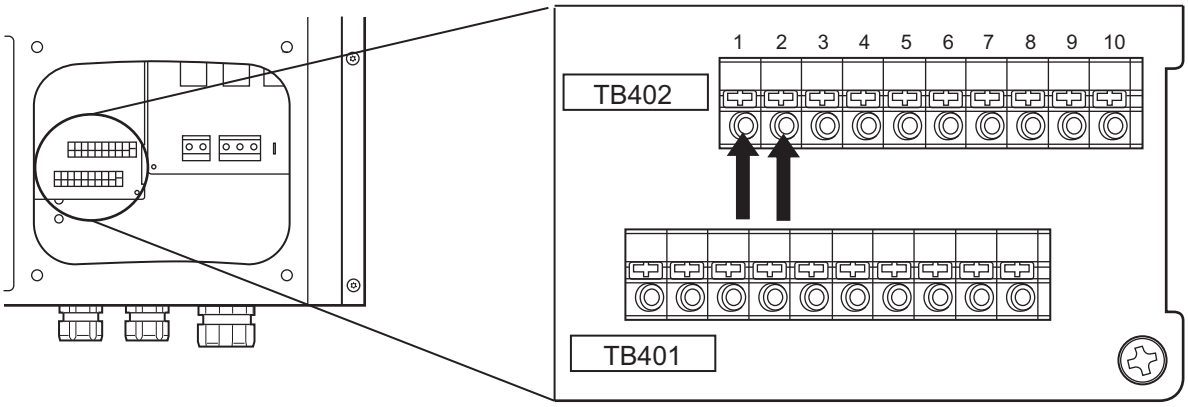
*Note: Note the wrong wiring of the signal wire, and the catch of the insulating coating.



(5)-3 AUX_IN

Connect the wire to 1 : AUX_IN+, 2 : AUX_IN- of AUX terminal block(TB402). When you connect the wire, insert the wire while you push the black button of TB402 and release the button.

Note: Note the wrong wiring of the signal wire, and the catch of the insulating coating.

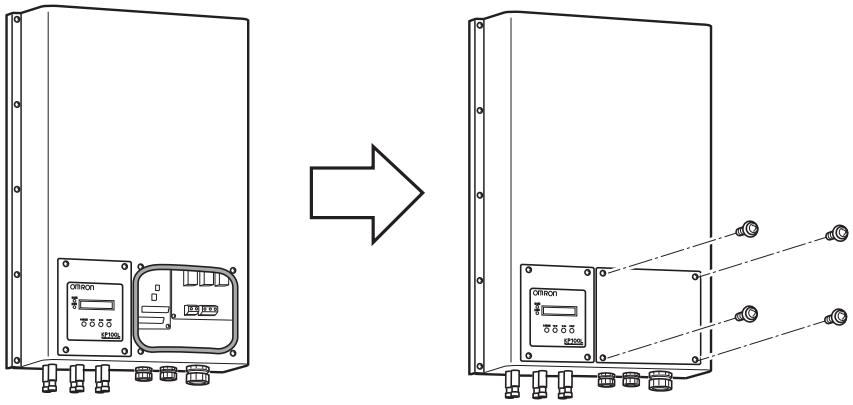


(6) Tighten the cap of the cable clamp surely.

If the tightening is insufficient, the effect of the waterproof is not achieved.

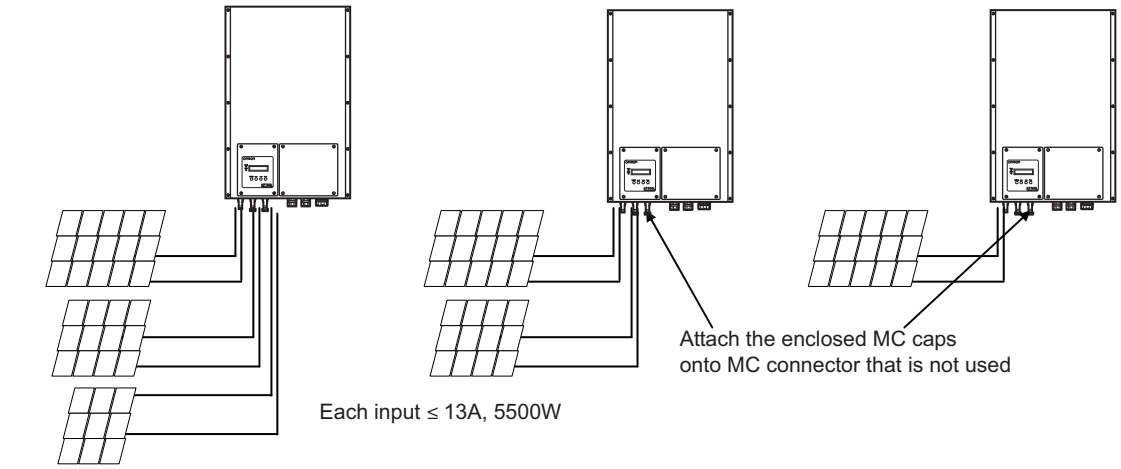
■Attachment of cover foreside R

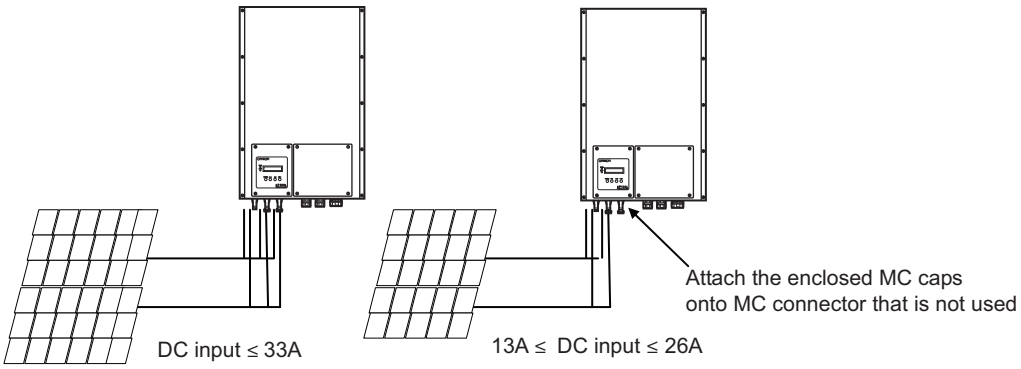
Mount the cover foreside R by the 4 screws surely by a TX20 Torx screwdriver (tightening torque : 1.5 to1.7N·m). When tightening the screws is insufficient, the effect of the waterproof is not achieved.



■Wiring the KP100L to the Solar Modules

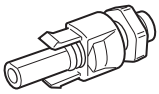
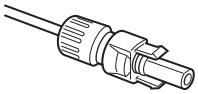
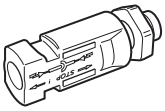
- First make sure the maximum open circuit voltage Voc of each PV string is below 850 VDC under any condition.
- Always connect solar module positive (+) terminal to KP100L DC positive (+) input, and the solar module negative (-) terminal to KP100L DC negative (-) input.
- KP100L has 3 MPPT. Usually solar modules are connected to 3 DC inputs as illustrated in figure below. Attach the enclosed MC caps onto MC connector that is not used. Each set of DC inputs allows to input DC current up to 13A. 3 pairs of DC inputs allows to input totally up to 33A. Maximum PV input power for each MPPT is 5,500W.
- One PV-array can be connected to 3 DC input in parallel as illustrated in figure below. To fully optimize the PV output set-up, use the following configuration guidelines:
  (a) For PV output ≤ 13A, use a single pair of DC input.
  (b) For 13A ≤ PV output ≤ 26A, use 2 sets of DC inputs.
  (c) For 26A ≤ PV output ≤ 33A, use 3 sets of DC inputs.



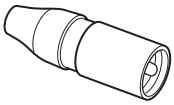
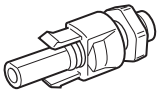
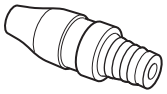
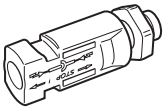


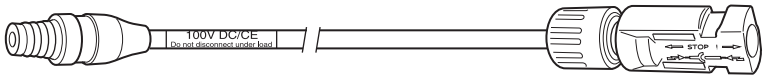
Be especially careful about electric shocks during the daytime, because that is when the solar modules are in the power generating mode. Confirm the polarity of the cable from the solar modules to ensure correct connection and make sure that there is no slackness of MC connectors.

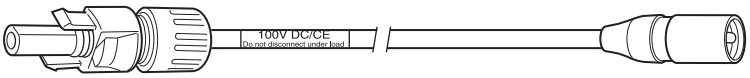
For the DC terminal of the KP100L, use the standard MC4 connectors.
Model type of connectors is shown below.

Solar module side (MC4 series)	KP100L side (MC4 series)
PV-KST4	 PV-ADBP4
 PV-KBT4	 PV-ADSP4

Multi-Contact sells the conversion cable to MC3 and MC4(PV-A-KBT3/KST4,PV-A-KBT3/KST3). If you use MC3 series in the solar module, refer to these conversion cable below.

Solar module side (MC3 series)	KP100L side (MC4 series)
 PV-KST3	 PV-ADBP4
 PV-KBT3	 PV-ADSP4

PV-A-KBT3 / KST4 

PV-A-KBT4 / KST3 

2.5 Check List

Each of the Inverter has been installed to be used in accordance with the instructions listed in the manual or the product specification; eg. ambient temperature, annual operation time, installation place, no direct exposure to sun light and direct rain fall, mounting distances and protection against toxic gas and other harmful gas environment, dust and other contamination.

Ensure that you have checked and verified the following points:

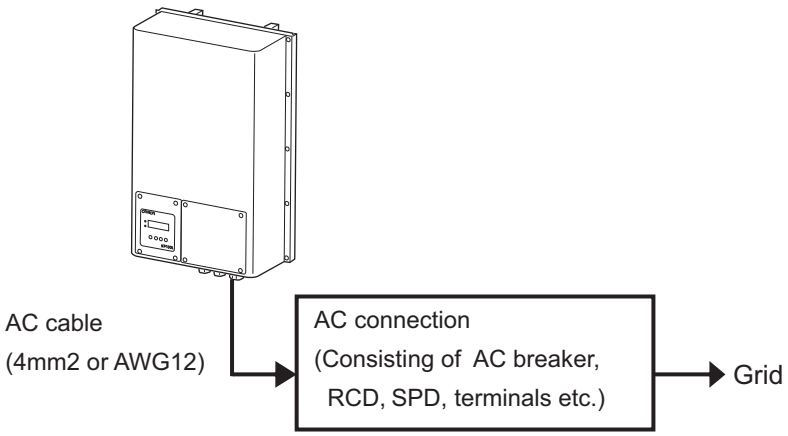
- ☐ The provided mounting base plate for the KP100L is attached and fixed securely and correctly.
- ☐ The inverter is mounted securely in the mounting base plate.
- ☐ There has been no use of parts or accessory other than Omron has provided and/ or specify.
- ☐ There has been no drop-off of the inverter or damage given when the inverter are installed and set up.
- ☐ There has been no mechanical stress, which applies continuously yet negligible, such as vibration or shock to the inverter.
- ☐ The heat sink of the inverters is purged to avoid any clog of air convection and do not place any objects close to the air duct.
- ☐ All the wires and cables are connected to correct polarity.
- ☐ MC connectors have been fastened and not deteriorated.
- ☐ "Screws of AC cable" has been fastened.
- ☐ Cover foreside R has been fastened and the cable clamps have been tightened correctly.
- ☐ Solar modules have been installed properly and they perform as designated.
- ☐ Open circuit voltage MUST not exceed 850 VDC under operating temperature (-20 to 60°C).
- ☐ Short-circuit DC current MUST not exceed 13 A DC per one DC input.
- ☐ Cables on AC side have low resistance enough to constrain an increase of the grid voltage at the terminal of connection (or other side of grid transformer) and loss is less than 1% of rated power of the inverter.
- ☐ There has been a protection against lightening surge put on DC side of the inverter, in particular, in a place where it is often seen
- ☐ There has been a protection against surge (spike) voltage and grid instability on AC grid lines to avoid any adverse influence from a nearby construction work or similar unusual event
- ☐ There has been a protection against a less quality grid connection, in particular, in an industrial estate or near one
- ☐ There has been no modifications performed by a party other than OMRON in a product specification.
- ☐ There has been no other apparatus without grounding (eg. washing machine) on the same grid lines.
- ☐ There has been no installation or set-up such as that cause the inverter to chatter repeatedly intervention and re-generation of power at startup and stop.

2.6 Connecting to the Grid

Wiring the KP100L to the Grid

The AC connection unit is an interface between the KP100L and the grid. It may consist of AC breaker, RCD, SPD, terminals, etc. for connection to both the KP100L and the grid. This AC connection unit must be designed by qualified technician to comply with local safety standards.

Use a 20 A trip AC breaker.



■Preliminary Confirmations

Check the following items before wiring.

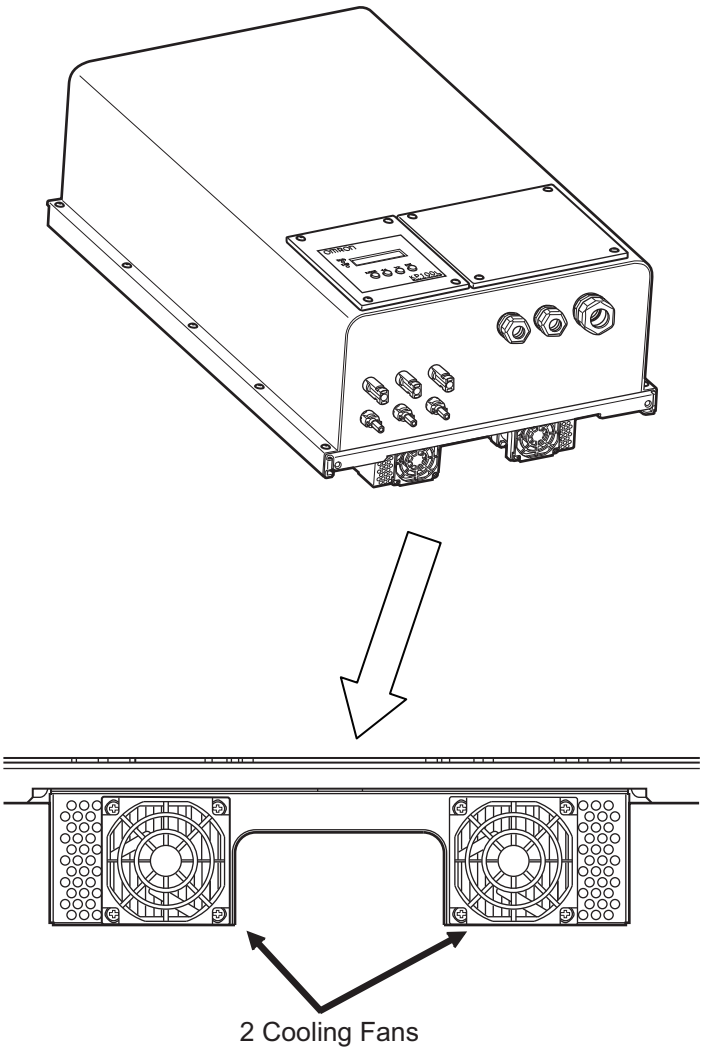
No.	Inspection Item	Procedure, Measurement or Confirmation	Checkmark
1	Solar module installation condition	Visual confirmation: Refer to the technical manual for the solar modules.	
2	KP100L installation condition	Visual confirmation: Make sure none of the mounting screws are loose. Make sure that the KP100L and the mounting base plate are securely fixed with the mounting screws.	
3	Wiring, connection, and conductivity	Visual confirmation: Inspect for looseness in clamps and screws, proper wire connection, and conductivity.	
4	KP100L ground resistance	Measurement confirmation: Standard: 100Ωmax. KP100L actual measurement: _____Ω	

No.	Inspection Item	Procedure, Measurement or Confirmation	Checkmark
5	Connect the Solar modules	High voltages exist when the Solar modules are exposed to the sun. Exposed terminals of the Solar modules are live, and can cause electric shock. Avoid making physical contact with live parts of the device.	
		After the Solar modules are connected to KP100L, the input voltage is greater than 200 VDC, the LCD displays the country setting at first time operation. Set a specified country. Refer to section "3.2 Procedure at the First Time Operation" for detail.	
		After the country setting, the input voltage is greater than 200 VDC and the AC grid is not connected to the KP100L, the LCD displays. Fault E1-0 No Utility	
		Voltage measurement for each solar module string Measurement confirmation: DC1 V DC2 V DC3 V	
6	Grid voltage confirmation	Measure to confirm that the grid voltage is about 230 V.	
		Actual measurement: $AC_{(L1)}$ V $AC_{(L2)}$ V $AC_{(L3)}$ V	
7	Power-ON delay time for grid-connected operation	Step 1: Check the connection between KP100L and AC Connection System. And then check the connection between the Grid and AC Connection unit. Close the AC breaker or fuse in the unit.	
		Step 2 Measure the time until operation resumes.	
		Step 3 Confirm that the displays the status "Normal" and that the KP100L performs the grid connect operation. Pac 1.5kW 0.50/0.50/0.50kW The KP100L is feeding power to the grid, and the green LED displays.	
8	Confirm the wattmeter	The Wattmeter installed to count the injected electricity should work while the inverter displays that electricity is being injected.	

2.7 Maintenance Parts

FAN

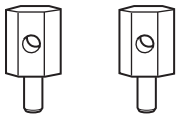
The KP100L has the two fans of maintenance parts. Refer to "Chapter 4 Maintenance Operations" for the alarm of the fans exchange. Refer to "Chapter 5 Inspection and Maintenance" for exchange procedure of the fans.



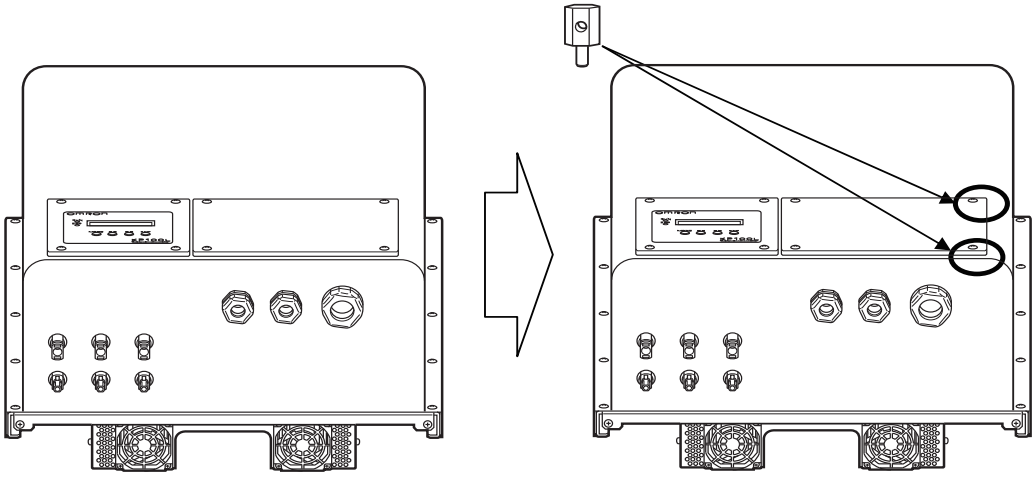
2.8 Options

■The screw of hexagon (For Italy)

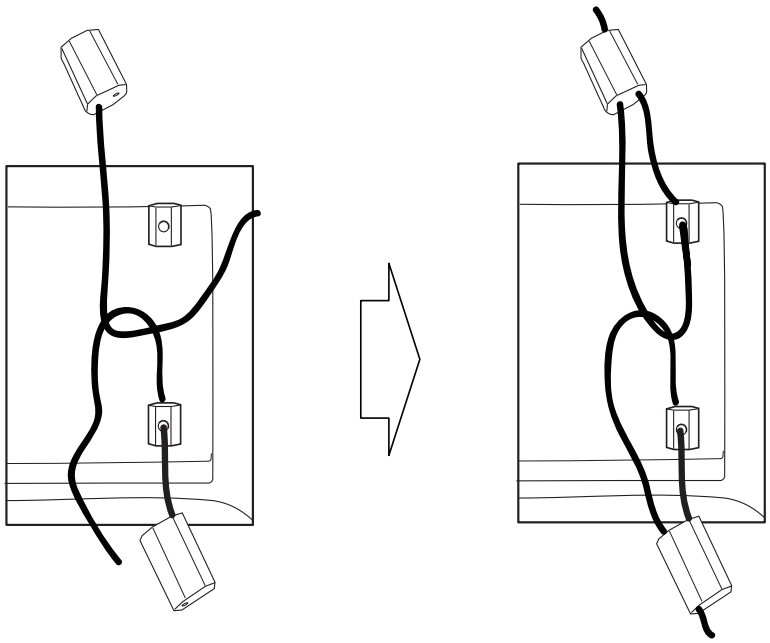
The customer who uses KP100L in Italy must buy the following screw. And, fix Cover foreside R according to the following procedure. This is a requirements of ENEL guideline.
Execute the procedure below to seal the cover foreside after AC connection.



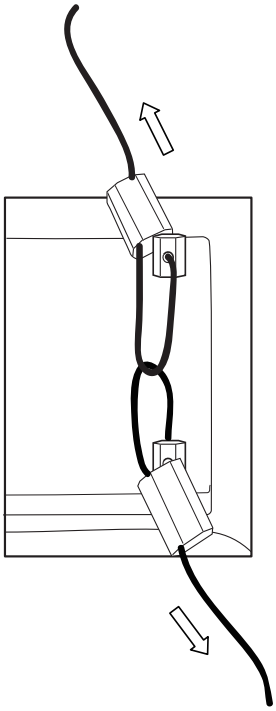
(1) Remove the screw 2 points where cover foreside R is fixed, and fix with the bought screw. (Tightening torque :1.5 to 1.7 N·m)



(2) Pass the steel wire through the part of the fixed hole of 2 screws. And, pass the steel wire through attachment as shown the figure.



(3) Pull the wires as shown in figure. Once you pull the wire firmly, you can not loose it.



■DC SWITCH

It is necessary to use DC switch or circuit breaker which complies to the installation standard for photovoltaic systems (VDE0100-712).
When you install where you require the DC switch such as Germany, please consult your OMRON representative

3

Operation

3.1 Part Names and Descriptions of Operation and Display Part 3-4
3.2 Procedure at the First Time Operation 3-5
3.3 Display transition 3-10
3.4 State Display 3-11
3.5 Mode Selection Display 3-13
3.6 Setting in Particular Countries 3-28
3.7 Confirm method of LCD display 3-44

■ Important user information:

Observe the following warnings and cautions when using the KP100L.

⚠ WARNING

Significant injury by electric shock may possibly occur. Do not touch the terminal of the MC connector. Do not remove the MC connector by any method other than that specified in the instruction.

Injury by electric shock may possibly occur. Do not open the cover foreside R when the product is energized.

⚠ CAUTION

Burn injury may occasionally occur. Do not touch the upper part of the product while operating or immediately after having turned off power.

Fire damage or functional lesion of internal part may occasionally occur. Do not obstruct the heat sink or place any objects within 200mm of the heat sink.

Injury or fire by electric shock may possibly occur. Do not open, disassemble, modify, or repair the cover front and the cover foreside L during operation.

Functional lesion by fire damage may occasionally occur. Do not unfasten the MC connector and clamp cable during operation.

■ Important installer information:

Observe the following warnings and cautions when installing the KP100L.

⚠ WARNING

Burn injury may occasionally occur. Do not touch the upper part of the product while operating or immediately after having turned off power.

⚠ CAUTION

Burn injury may occur. Do not touch the upper part of the product while operating or immediately after having turned off power.

Fire damage or functional lesion of internal part may occasionally occur. Do not obstruct the heat sink or place any objects within 200mm of the heat sink.

Break down or deterioration of the solar modules may occasionally occur. Install the breaker between the transformer and the KP100L when you connect the transformer. Connect the Neutral of the transformer to the earth.

Injury or fire by electric shock may possibly occur. Do not open, disassemble, modify, or repair the cover front and the cover foreside L during operation.

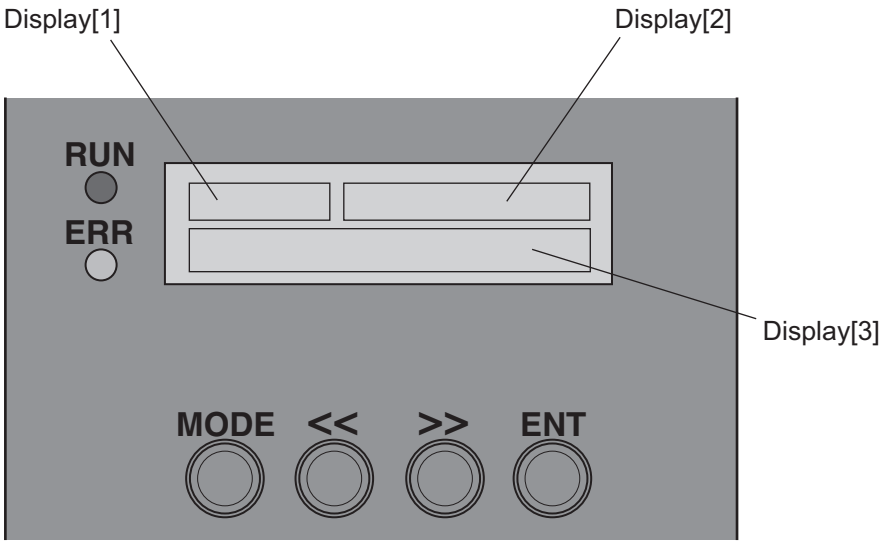
Electric shock or fire by the foreign body going into the product may occasionally occur. Prevent foreign objects body from invading from getting inside when you are installing wiring.

Precautions for Correct Use

■ Use the Product

- Do not stand on the product or place any objects on the product.
- Serious injury may occur due to fire. Do not use the product in a flammable gas atmosphere (including flammable sprays such as pesticides).

3.1 Part Names and Descriptions of Operation and Display Part



	Name	Description
LED(Green)	RUN	Lit when the KP100L is running.
LED (Red)	ERR	Lit when the KP100L error occur.
LCD	Display [1]	Displays the data name of Display [3].
	Display [2]	Displays the status data.
	Display [3]	Displays measurement value, error content and set value that user selected.
Key	MODE	Changes display modes.
	<<	Changes (Reverse-sending) the display mode and set value.
	>>	Changes (Order-sending) the display mode and set value.
	ENT	Enter the display mode and set value.

3.2 Procedure at the First Time Operation

■ Procedure at the First Time Operation

The procedure at the first time operation shows below.

(1) Connect the Solar modules to the KP100L.

(2) After turning OFF the AC breaker, wire the AC to the KP100L.

(3) Turns ON the breaker on the switch in DC side.

(4) After the LCD becomes the display of the country setting, set a specified country.

(5) Make sure that the display of the country setting is correct.

(6) Turn ON the AC breaker.

(7) Make sure that the KP100L starts running as indicated by the Display.

■ Turn ON the breaker on the solar module side to start the inverter

To start the inverter, turn ON the breaker on the solar module side.

■ Country Setting

Procedure of the Country Setting

⚠ WARNING

After once setting the country setting, you can't change the country setting. Be careful when you set it.
Significant property damage may possibly occur. Do not use the product with a mistake of the country setting. Contact store purchased when you fix the country setting by mistake.

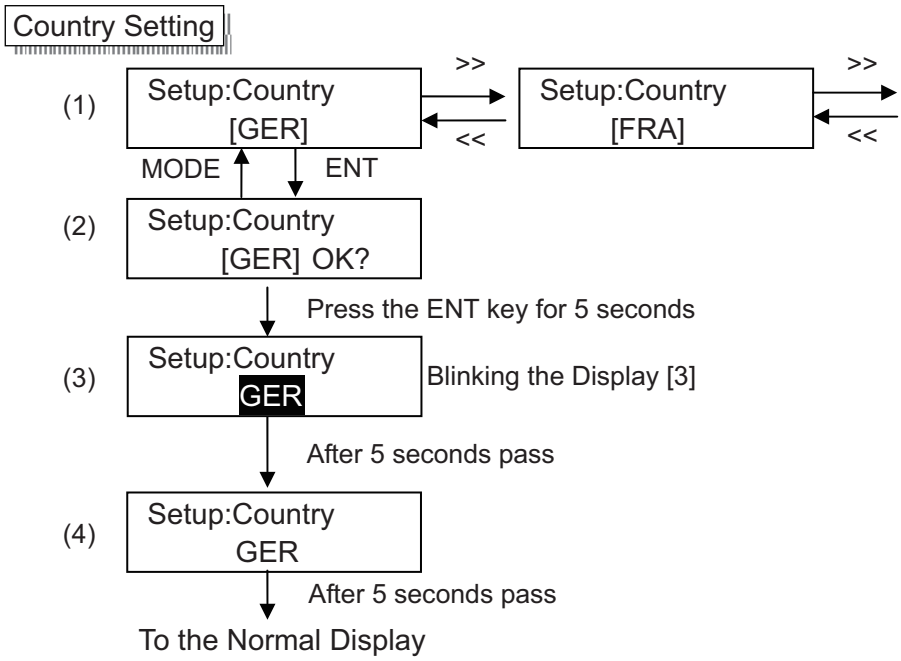
The display moves to the Country Setting when you start KP100L with the country setting not fixed Refer to below for setup. Table shows the relation between the menu and the country. You can't set the country other than countries shown in the table. The KP100L complies with local and national standards when correct country is selected.
Refer to P. 3 - 43 for the detect level in each country.

<KP100L-OD-EU>

Menu	[GER]	[FRA]	[GRE]	[CZE]	[DEN]	[TUR]	[RSA]	[ESP]	[POR]	[ITA]
Country	Germany	France	Greece	Czech Republic	Denmark	Turkey	Republic of South Africa	Spain	Portugal	Italy

<KP100L-OD-KR>

Menu	[KOR]
Country	Korea



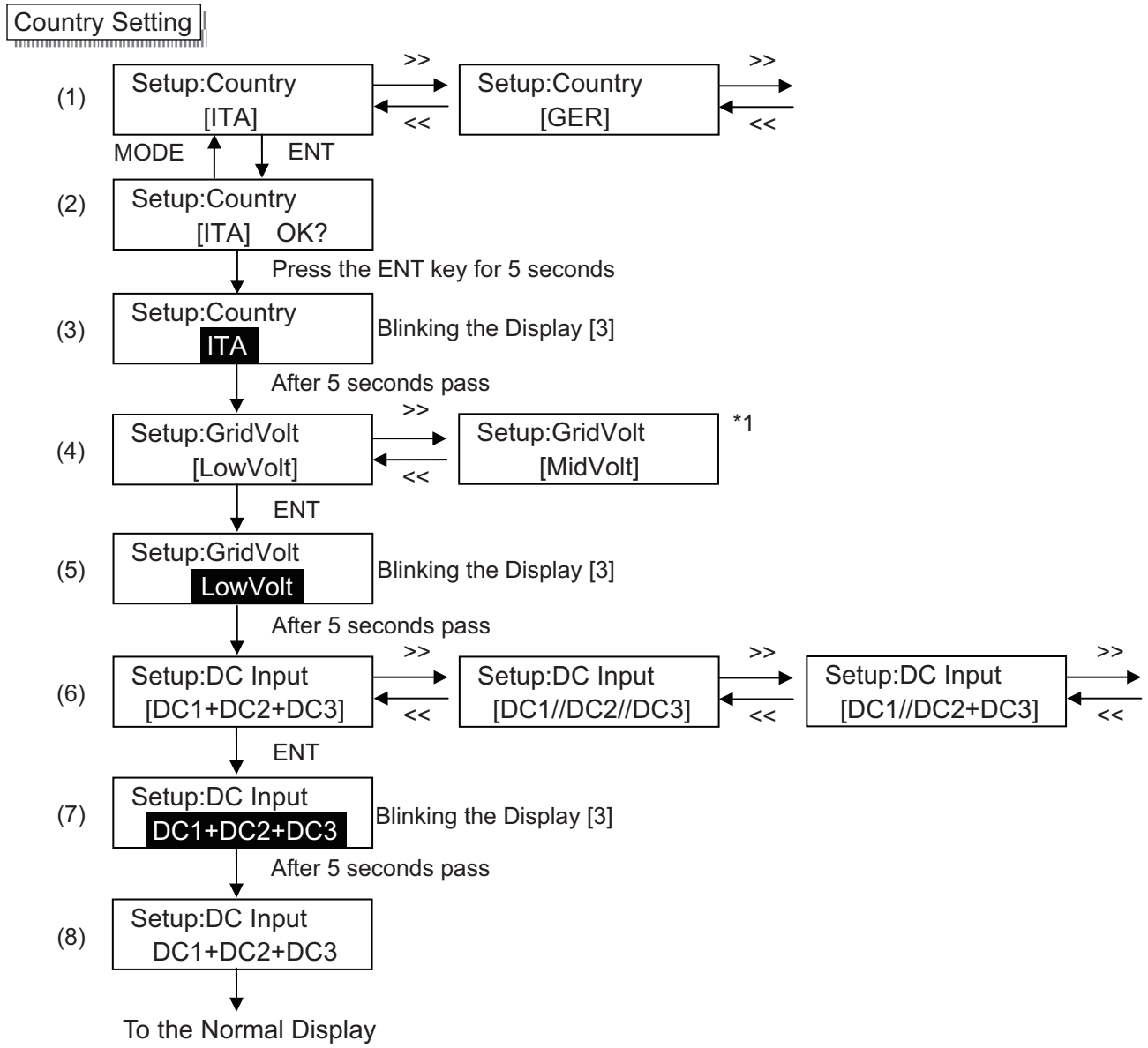
(1) In the country selection display, select the items that you want to set by the "<<" and ">>" keys and you decide the item by the ENT key.

(2) In the last confirmation display of country setting, fix the country setting when you press the ENT key for 5 seconds. You can return to the country selection display, when you press the MODE key.

(3) While the last confirmation display of country setting, the country name does the blinking display. The key operation becomes invalid. After 5 seconds, display change to next display.

(4) In the last display of the setting country, the country name does the lighting display. The key operation remains invalid. After 5 seconds, display change to next display.

Country Setting only for Italy



(1) In the country selection display, select the items that you want to set by the "<<" and ">>" keys and you decide the item by the ENT key.

(2) In the last confirmation display of country setting, fix the country setting when you press the ENT key for 5 seconds. You can return to the country selection display, when you press the MODE key.

(3) While the last confirmation display of country setting, the country name does the blinking display. The key operation becomes invalid. After 5 seconds, display change to next display.

(4) In the connection to LV (Low Voltage) / MV (Medium(Middle) Voltage) network selection display, select the items that you want to set by the "<<" and ">>" keys and you decide the item by the ENT key.
*1 In case of firmware from V1.00 to V1.23, you can't select MV network connection.

(5) While the last confirmation display of connection to LV/MV network setting, the connection to LV/MV network does the blinking display. The key operation becomes invalid. After 5 seconds, display change to next display.

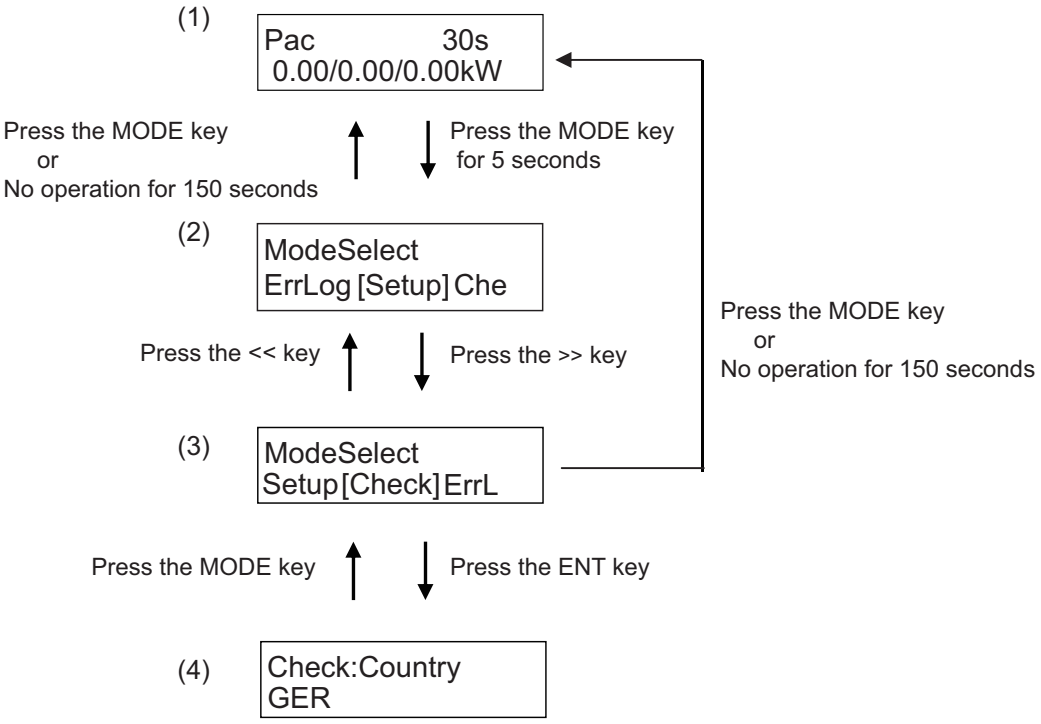
(6) In the DC input connection selection display, select the items that you want to set by the "<<" and ">>" keys and you decide the item by the ENT key. The sign "+" indicates indipendent inputs and the sign "//" indicates parallel inputs. Refer to section "3.6 Setting in Particular Countries" for detail.

(7) While the last confirmation display of DC Input setting, the setting of DC Input does the blinking display. The key operation becomes invalid. After 5 seconds, display change to next display.

(8) In the last display of the setting country, the setting of DC Input does the lighting display. The key operation remains invalid. After 5 seconds, display change to next display.

Procedure of the country setting confirmation

Make sure that the country setting is correct. Refer to the below Figure about the setting.



(1) In the normal display, if you press the MODE key for 5 seconds, display change to the selection display.

(2) In the selection display, press the ">>" key and choose "Check".

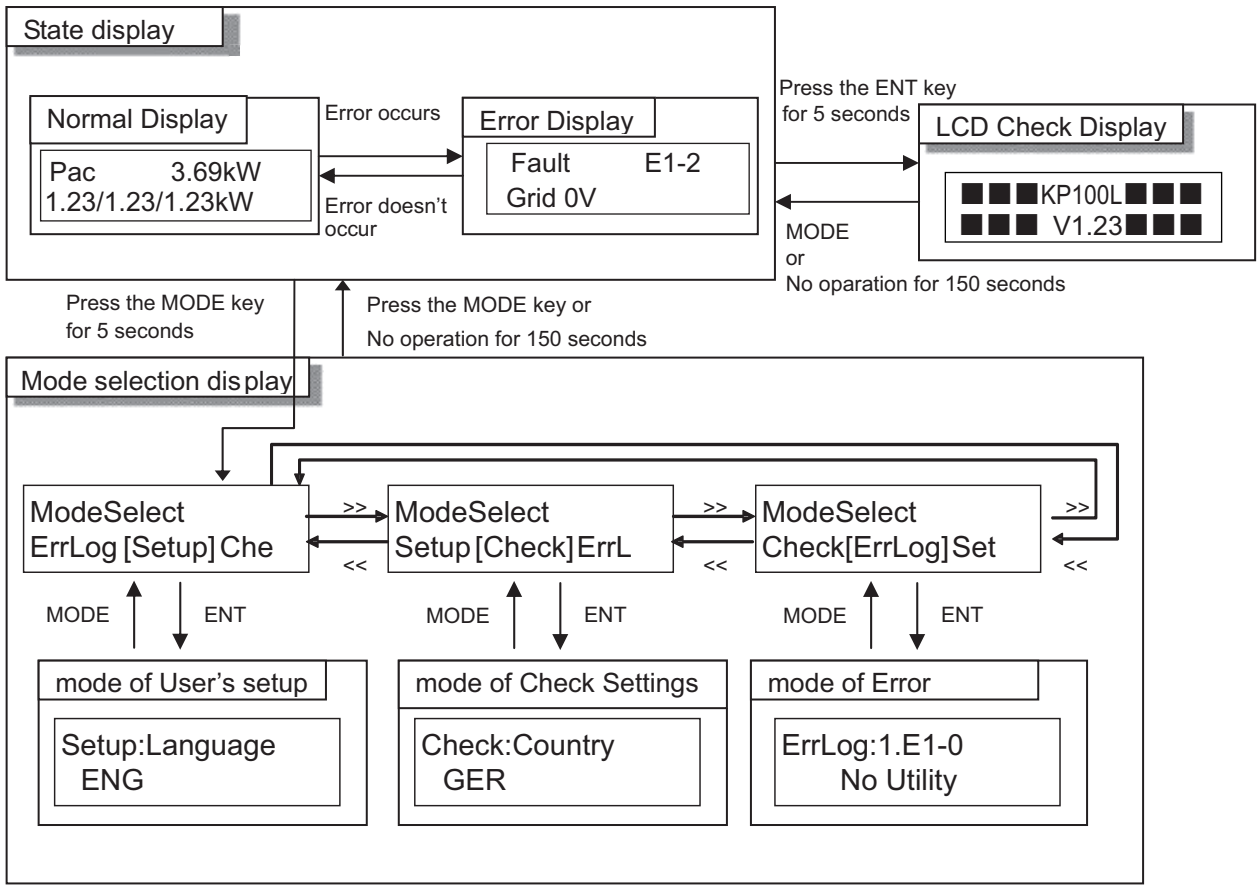
(3) After you choose “Check“, press the ENT key.

(4) Display shows the country setting. Make sure the name of a country .

(5) Press the MODE key to return the selection display. After that press the MODE key to return normal display.

3.3 Display transition

The display according to the state of the KP100L and the key operation is shown after the KP100L starts. The following show the image of the display transition.



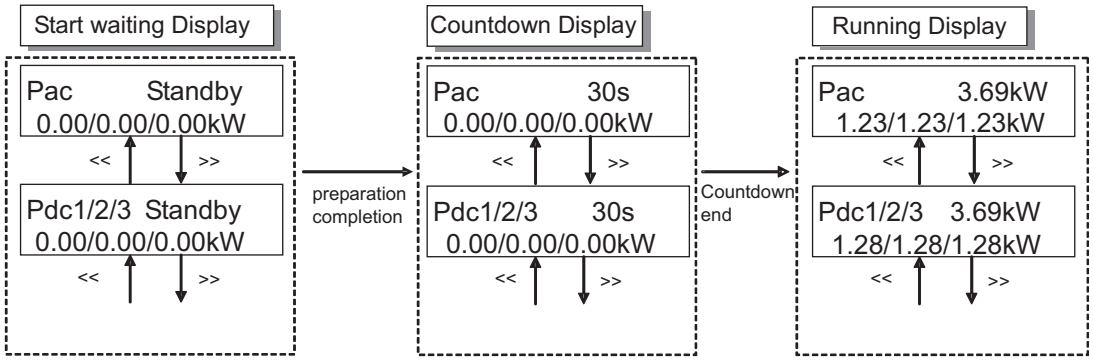
Item	Description
State display	You can check operating state of KP100L.
Normal Display	The display of state of KP100L. Refer to section "3.4 State Display" for detail.
Error Display	The occurring error is displayed. Refer to section "3.4 State Display" for detail.
Mode selection display	You can select from this display to each mode of User's setup / Check Settings / Error Logging.
mode of User's setup	You can set the setup value. Refer to section "3.5 Mode Selection Display" for detail.
mode of Check Settings	You can check the setup value. Refer to section "3.5 Mode Selection Display" for detail.
mode of Error Logging	You can confirm the error that occurred in the past. Refer to section "3.5 Mode Selection Display" for detail.
LCD Check Display	You can check LCD. Refer to section "3.7 Confirm method of LCD display" for detail.

3.4 State Display

The display according to the state of the KP100L is shown. State Display includes Normal Display and Error Display.

■ Normal Display

When the error doesn't occur in the KP100L, the follow content corresponding to the state of the KP100L is displayed.



The Display [2] shows data and the state corresponding to the state of KP100L at that time.

State	Display (example)	Content of Data
Countdown	30s	Start-up delay time
Start waiting	Standby	-
Running	1.23kW * While the active power control is operating, the value of AC Power blinks.	AC Power
Stopping	OFF	-

The Display [3] shows the measurement value. Select the measurement value that you want to display by pressing the "<<" or ">>" key. The displayed item is changed every 0.5 seconds when you keep pressing the "<<" or ">>" key. The Display [1] shows the item name of the data displayed in the Display [3].
Refer to the follow table for the item that you can select.

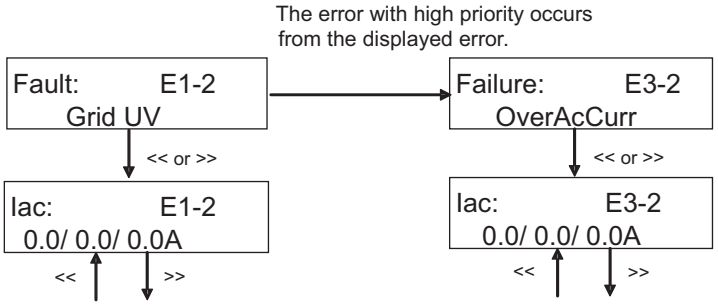
Item name	Measurement Value	Data display form
Pac	AC Power(L1 phase/L2 phase/L3 phase)	1.23/1.23/1.23kW
Pdc1/2/3	DC Power (DC1/DC2/DC3)	1.23/1.23/1.23kW
Vac	Grid Voltage(L1 phase/L2 phase/L3 phase)	230/230/230V
Freq	Grid Frequency	50.0Hz
Iac	AC Current (L1 phase/L2 phase/L3 phase)	12.3/12.3/12.3A
Vdc1/2/3	DC Voltage (DC1/DC2/DC3)	400/400/400V
Idc1/2/3	DC Current (DC1/DC2/DC3)	12.3/12.3/12.3A
E-today	Daily energy production	123.4kWh
H-total	accumulated operation time	123456hr
E-total	Total Periodic Energy (accumulated energy from time user reset) E-total can be reset by user. Refer to section "3.5 Mode Selection Display" , [15] Clear of Total Periodic Energy	12345kWh

■ Error Display

When an error occurred, the error code and the error content that shows the occurred error are displayed.
The Display [1] shows "Fault", "Failure" or "Warning" according to the type of occurring error. The Display [2] shows the error code. The Display [3] shows the error content. (Refer to section "A.1 Error list" for the error type of each error.) When an error occur, KP100L stop power generation except "A2-5: Abnormality of fan".
When two or more errors occur at the same time, the error with the highest priority is displayed. The Display [3] change from the display of the error content into the display of the measurement value when the "<<" or ">>" key is pressed while the error occurring.

Refer to the follow definition of "Fault", "Failure", "Warning".

type of occurring error	Definition
"Fault"	Error of systems such as Solar module and Grid
"Failure"	Kind of hardware breakdown of KP100L
"Warning"	Warning

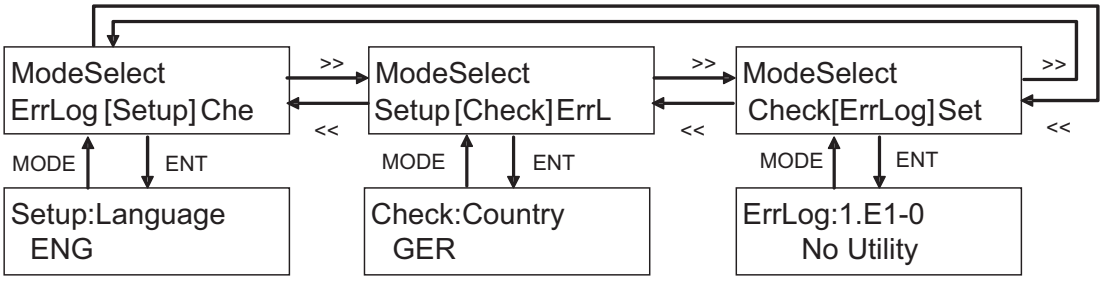


3.5 Mode Selection Display

The display changes into the mode selection display if you press the MODE key for 5 seconds while the normal display or the error display.

You can change the mode of user setting or setting confirmation or error logging from the mode selection display. The display changes when the ENT key is pressed after you select the mode that you want to change by you press the "<< "and ">>" keys.

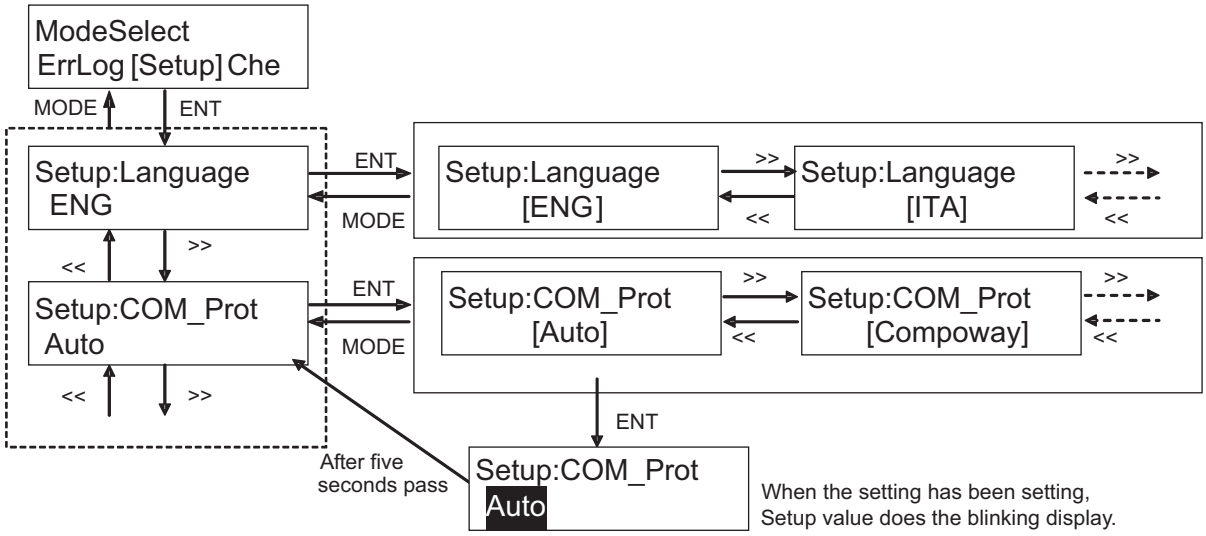
[Transition of the each mode]



Menu	Item	Description
Setup	User's setup	You can set the setup value.
Check	Check Settings	You can check the setup value for confirmation.
ErrLog	Error Logging	You can confirm the error that occurred in the past.

■ User's setup

In the mode of User's setup, you can set the language of display and the communication's parameter, etc.
In the selection display, the display changes into the mode of User's setup if you select "Setup" and press the ENT key. When you set the item in the mode of User's setup, relay turns off and power generation stops.



In the mode of User's setup, select the items that you want to set by the "<<" and ">>" keys and decision the item by the ENT key. Next, select the value that you want to set by the "<<" and ">>" keys and decision the set value by the ENT key.
It back to the display of the item selection without changing a set value when you press the MODE key while you change a set value. It returns to the selection display when you press the MODE key while displaying the item selection.

Refer to the following table for the item and the set value that you can set.

Note: For setting of some parameters related to communication, after set the parameter, disconnect the solar modules (turn-off the switch in DC side) and connect again to confirm the value. Refer to explanation in P. 3 - 19 for more detail.

	Item	display	Set Value	Mean	default value	Unit
[1]	Setup of Language	Language	ENG	English	ENG	-
			ITA	Italian		
			ESP	Spanish		
			GER	German		
			FRA	French		
[2]	Communication protocol [Compoway/F, Modbus]	COM_Prot	Auto	Auto distinction	Auto	-
			Compoway	Compoway/F		
			Modbus	Modbus		
[3]	Communication Unit Number (*1) [Compoway/F, Modbus]	COM_Unit	0 to 99		0	-
[4]	Communication Baud rate (RS-232C) [Compoway/F]	COM_232C	4800		9600	bps
			9600			
			19200			
[5]	Communication Baud rate (RS-485) [Compoway/F, Modbus]	COM_485	4800		19200	bps
			9600			
			19200			
[6]	Communication Parity [Modbus]	COM_Pari	None	No parity	Even	-
			Even	Even parity		
			Odd	Odd parity		
[7]	Communication Stop bit [Modbus]	COM_Stop	1		1	bit
			2			
[8]	RS-485 Communication Send wait time (*2) [Compoway/F, Modbus]	COM_Wait	3 to 99		3	ms
[9]	Setup of Grid Connection to LV/MV network (ITA only)	GridVolt	LowVolt	Low voltage network connection	LowVolt	-
			MidVolt	Medium(Middle) voltage network connection		
[10]	Setup of DC input connection (ITA only)	DC Input	DC1+DC2+ DC3	Multi (independent) input of all	DC1+DC2+ DC3	-
			DC1//DC2// DC3	Parallel (single) input of all		
			DC1//DC2+ DC3	Multi (independent) input of DC3 and parallel (single) input of DC1 and DC2		
			DC1+DC2// DC3	Multi (independent) input of DC1 and parallel (single) input of DC2 and DC3		
			DC1//DC3+ DC2	Multi (independent) input of DC2 and parallel (single) input of DC1 and DC3		
[11]	Setup of Reconnection time (ITA only)	RecTime	0 to 900 (5sec/step)		300	sec
[12]	Change of parameter level (GRE only)	PARAM_LV	0,1		0	-
[13]	Setup level for control of the grid voltage increasing	PF_LV	0.0 to –30.0	OV setup level - this setup level	0.0	V
[14]	Setup of Output Signal 1 (Relay outputs: AUX_OUT1)	OutSig1	MODE1	Breakdown output mode	MODE1	-
			MODE2	Output mode of PV system's fault		
			MODE3	Output mode of grid system's fault		
			MODE4	Output mode of all errors		
			MODE5	Output mode of all errors (except grid system's fault)		

	Item	display	Set Value	Mean	default value	Unit
[15]	Setup of Output Signal 2 (Relay outputs: AUX_OUT2)	OutSig2	MODE1	synchronization mode with grid relay	MODE1	-
			MODE2	synchronization mode with communication		
[16]	Setup of Input Signal (PHC INPUT: AUX_IN)	InputSig	MODE1	Operation stop mode	MODE1	-
			MODE2	Gate block mode		
[17]	Error Reset	ErrReset	-		-	-
[18]	Clear of Total Periodic Energy	TotalClr	-		-	-
[19]	Auto Test (ITA only)	AutoTest	-		-	-
[20]	Setup mode of Power Factor (PF) (GER,DEN)	cos ϕ	1.000	Recieve external command	1.000	-
			AUTO 0.95	AUTO(Max0.95)		
			AUTO 0.90	AUTO(Max0.90)		
			D 0.975	Leading PF:0.975 constant		
			D 0.950	Leading PF:0.950 constant		
			D 0.925	Leading PF:0.925 constant		
			D 0.900	Leading PF:0.900 constant		
			D 0.875	Leading PF:0.875 constant		
			D 0.850	Leading PF:0.850 constant		
			G 0.975	Lagging PF:0.975 constant		
			G 0.950	Lagging PF:0.950 constant		

	Item	display	Set Value	Mean	default value	Unit
[21]	Setup mode of Reactive Power Control (ITA LV only)	Q	1.000	Recieve external command of PF	percent	-
			Auto 0.95	AUTO PF(Max0.95)		
			Auto 0.90	AUTO PF(Max0.90)		
			D 0.975	Leading PF:0.975 constant		
			D 0.950	Leading PF:0.950 constant		
			D 0.925	Leading PF:0.925 constant		
			D 0.900	Leading PF:0.900 constant		
			D 0.875	Leading PF:0.875 constant		
			D 0.850	Leading PF:0.850 constant		
			G 0.975	Lagging PF:0.975 constant		
			G 0.950	Lagging PF:0.950 constant		
			G 0.925	Lagging PF:0.925 constant		
			G 0.900	Lagging PF:0.900 constant		
			Percent	Recieve external command of reactive power		
			AUTO CEI	cos ϕ =f(P) Mode		
			D 5	Leading reactive power:5% constant		
			D 10	Leading reactive power:10% constant		
			D 15	Leading reactive power:15% constant		
			D 20	Leading reactive power:20% constant		
			D 25	Leading reactive power:25% constant		
			D 30	Leading reactive power:30% constant		
			D 35	Leading reactive power:35% constant		
			D 40	Leading reactive power:40% constant		
			D 45	Leading reactive power:45% constant		
			D 50	Leading reactive power:50% constant		
			G 5	Lagging reactive power:5% constant		
			G 10	Lagging reactive power:10% constant		
			G 15	Lagging reactive power:15% constant		
			G 20	Lagging reactive power:20% constant		
			G 25	Lagging reactive power:25% constant		
			G 30	Lagging reactive power:30% constant		
			G 35	Lagging reactive power:35% constant		
			G 40	Lagging reactive power:40% constant		
			G 45	Lagging reactive power:45% constant		
			G 50	Lagging reactive power:50% constant		
			Type B	Type B of Q=f(V) Mode		
[22]	Setup mode of Active Power Control (GER,ITA,DEN) (Limit of output power when output frequency is increasing)	Freq Lim	OFF	Disable	(GER,ITA,DEN): ON (except GER,ITA,DEN): OFF	-
[23]	Lock In Voltage (ITA LV only)	LockInV	100 to 110	Parameter for cos ϕ =f(P) Mode	105	%
[24]	Lock Out Voltage (ITA LV only)	LockOutV	90 to 100	Parameter for cos ϕ =f(P) Mode	98	%
[25]	Lock In Power (ITA LV only)	LockInP	10 to 100	Parameter for Q=f(V) Mode	20	%
[26]	v1s (ITA LV only)	V1s	100 to 110	Parameter for Q=f(V) Mode	108	%
[27]	v2s (ITA LV only)	V2s	100 to 110	Parameter for Q=f(V) Mode	110	%

	Item	display	Set Value	Mean	default value	Unit
[28]	v1i (ITA LV only)	V1i	90 to 100	Parameter for Q=f(V) Mode	92	%
[29]	v2i (ITA LV only)	V2i	90 to 100	Parameter for Q=f(V) Mode	90	%
[30]	Startup condition of OF (ITA only)	StartOF	50.05 to 51.00		50.10	Hz
[31]	Startup condition of UF (ITA only)	StartUF	49.00 to 49.95		49.90	Hz
[32]	Auto CEI Point A (ITA LV only)	Point A	5 to 100	Parameter for cos ϕ =f(P) Mode	20	%
[33]	Auto CEI Point B (ITA LV only)	Point B	5 to 100	Parameter for cos ϕ =f(P) Mode	50	%
[34]	Auto CEI point C (ITA LV only)	Point C	0.90 to 1.00	Parameter for cos ϕ =f(P) Mode	0.90	-
[35]	Auto CEI point D (ITA LV only)	Point D	5 to 100	Parameter for cos ϕ =f(P) Mode	5	%
[36]	Setup frequency limit of Active Power Control (ITA only)	Flim Val	2.0 to 5.0	Parameter for the frequency limit of Active Power Control	2.4	%
[37]	Startup frequency of Active Power Control (ITA only)	Fsta Val	50.00 to 52.00		50.30	Hz

*1 When communication protocol is set to Modbus , "Communication Unit Number 00" is communication unit number of broadcast. Thus, set "Communication Unit Number" not include 00 when you do the communications other than the Broadcast with Modbus.

*2 In the case of the Modbus setting, the silent interval is not included in the RS-485 Communication Send wait the time.

[1] Setup of Language
Set the language used for the display.

[2] Communication Protocol [Compoway/F, Modbus]
Set the protocol used for the communication.
If you set "Auto", the protocol of the received communication data is distinguished and it communicates by Compoway/F or Modbus.
After set the protocol, disconnect the solar modules (turn-off the switch in DC side) and connect again to confirm the value.

[3] Communication Unit Number [Compoway/F, Modbus]
Set the unit number used for the communication.
After set the unit number, disconnect the solar modules (turn-off the switch in DC side) and connect again to confirm the value.

[4] Communication Baud rate(RS-232C) [Compoway/F]
Set the transfer rate of the communication of RS-232C.
After set the baud rate, disconnect the solar modules (turn-off the switch in DC side) and connect again to confirm the value.

[5] Communication Baud rate(RS-485) [Compoway/F, Modbus]
Set the transfer rate of the communication of RS-485.
After set the baud rate, disconnect the solar modules (turn-off the switch in DC side) and connect again to confirm the value.

[6] Communication Parity [Modbus only]
Set the parity for the communication.
After set the parity, disconnect the solar modules (turn-off the switch in DC side) and connect again to confirm the value.

[7] Communication Stop bit [Modbus only]
Set the stop bit for the communication.
After set the stop bit, disconnect the solar modules (turn-off the switch in DC side) and connect again to confirm the value.

[8] RS-485 Communication Send wait the time [Compoway/F, Modbus]
Set the wait time from receiving of the RS-485 command to sending the RS-485 command.
Adjust the RS-485 Communication Send wait time of the KP100L according to the switch time of the RS-485 transmission enable of the host side.
After set the wait time, disconnect the solar modules (turn-off the switch in DC side) and connect again to confirm the value.

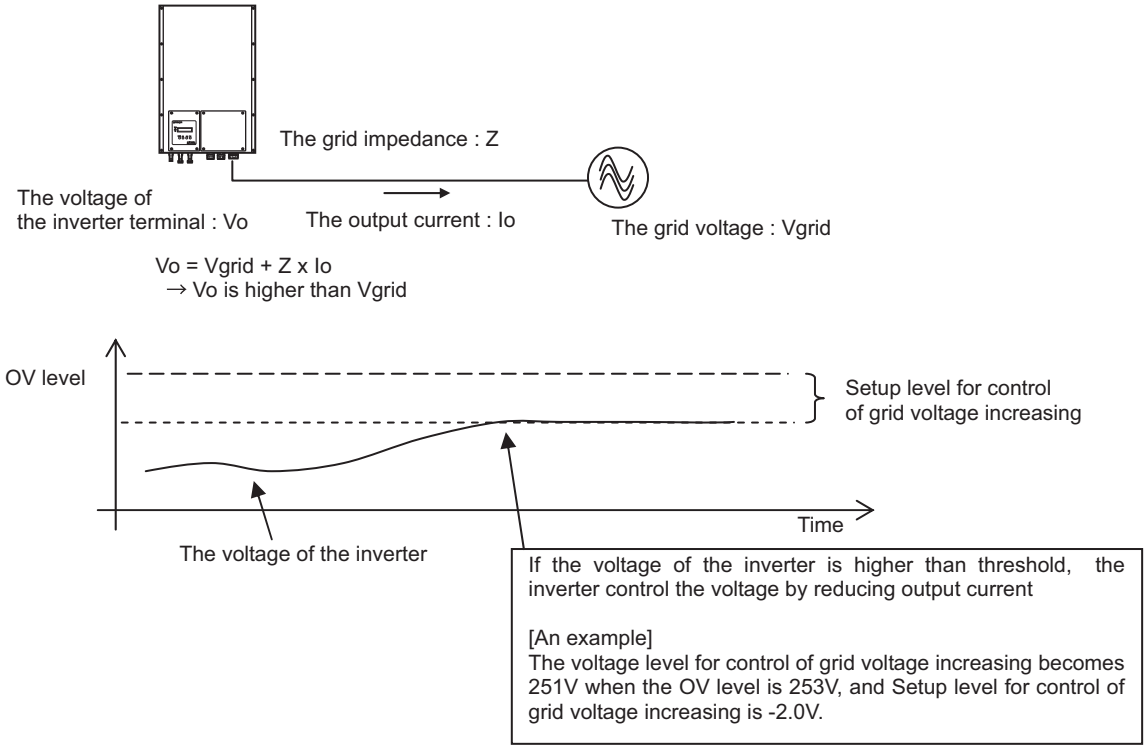
[9] Setup of Grid Connection to LV/MV network (Italy only)
Set the grid connection to Low Voltage network(LV) or Middle Voltage network(MV).

[10] Setup of DC input connection (Italy only)
Set the DC input connection.
Refer to section "3.6 Setting in Particular Countries" for detail.
* Except for Italy, KP100L detects DC Input connection automatically.

[11] Setup of Reconnection time (Italy only)
Set the reconnection time.

[12] Change of parameter level (Greece only)
Change the specific detect level. The detect level that you can change is different according to the country setting.
Refer to section "3.6 Setting in Particular Countries" for detail.

[13] Setup level for control of the grid voltage increasing
This is a function to prevent increasing of the grid voltage by controlling the output current when the grid voltage increases. This function can control the voltage of the inverter terminal before reaching OV level.
Setup level for control of the grid voltage increasing can decide the level of the grid voltage that controls the output current. The level for control of the grid voltage increasing is a level which decreases Setup level from the OV level.



[14] Setup of Output Signal 1
The output mode of "External output signal 1 (AUX_OUT1)" is set.
Set the output mode of signal according to the occurring error.
Refer to section "A.1 Error list" for the error that occurs when each MODE is set.

[15] Setup of Output Signal 2

The output mode of "External output signal 2 (AUX_OUT2) is set. Refer to the following table.

MODE	Description	State	Output of Relay
MODE1 (synchronization mode with grid relay)	The signal is output synchronizing with the state of Grid relay.	Grid relay → ON	ON
		Grid relay → OFF	OFF
MODE2 (synchronization mode with communication)	The signal is output synchronizing with the state of the communication.	Communication → Possible	ON
		Communication → Impossible	OFF

[16] Setup of Input Signal

When the signal input to "External input signal (AUX_IN)" is turned on, KP100L operates the following table.

MODE	Description
MODE1 (mode of stop)	When the input is turned on, KP100L stops running. "Stop" means that Relay turn off and stop power generation.
MODE2 (mode of Gate block)	When the input is turned on, KP100L does "Gate block". "Gate block" means only stop operation of inverter circuit.

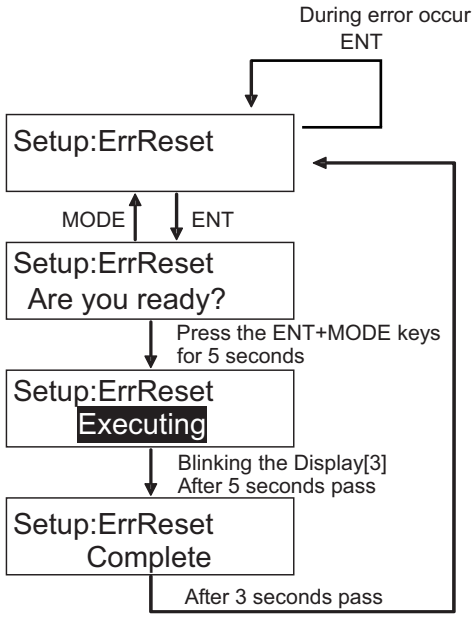
[17] Error Reset

You can reset occurring error. But error that you can reset is only the error that manual reset is possible.

[Operational Procedure]

At first, after display show the item name of "ErrReset" by you press the "<< "and ">>" keys, press the ENT key. When you press the ENT key and the MODE key at the same time for 5 seconds after the display became the execution confirmation "Are you ready?", the Error reset is executed. The display becomes the execution completion "Executing" after continuing the display executing Error reset for 5 seconds. After that, the display returns to the item selection after 3 seconds pass.

When you press the MODE key while showing the execution confirmation, the display returns to the item selection without you do Error reset.



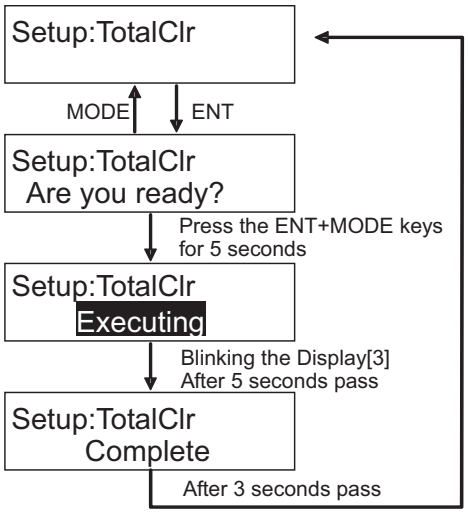
[18] Clear of Total Periodic Energy

Clear of Total Periodic Energy to 0.

[Operational Procedure]

At first, after showing the item name of "TotalClr" by you press the "<<" and ">>" keys, press the ENT key. When you press the ENT key and the MODE key at the same time for 5 seconds after the display became the execution confirmation "Are you ready?", the integral power consumption clear is executed. The display becomes the execution completion after continuing the display executing integral power consumption clear for 5 seconds. After that, the display returns to the item selection after 3 seconds pass.

Moreover, when you press the MODE key while displaying the execution confirmation, the display returns to the item selection without you do clear of Total Periodic Energy.



[19] Auto Test (Italy only)

Confirm each function of the OV(Over Voltage), UV(Under Voltage), OF(Over Frequency) and UF(Under Frequency).

Refer to section "3.6 Setting in Particular Countries" for detail.

[20] Setup mode of Power Factor (Germany, Denmark)

You can configure the power factor command. The power factor command that you can configure is different according to Grid operator.

Refer to section "3.6 Setting in Particular Countries" for detail.

[21] Setup mode of Reactive Power Control (Italy LV only)

Set the mode of reactive power control.

Refer to section "3.6 Setting in Particular Countries" for detail.

[22] Setup mode of Active Power Control (Germany, Italy, Denmark)
(Limit of output power when output frequency is increasing)

The function is configured automatically when you select the country selection display.

Refer to section "3.6 Setting in Particular Countries" for detail.

[23] - [29], [32] - [35] Setup parameter of Reactive Power Control (Italy LV only)

Set the parameter of reactive power control.

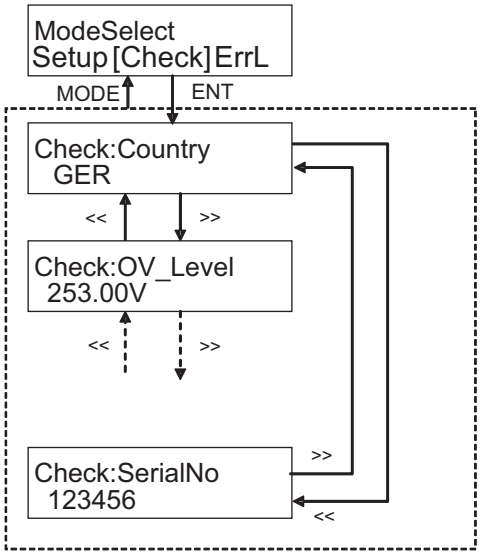
Refer to section "3.6 Setting in Particular Countries" for detail.

[30] - [31] Setup Startup condition of the fereqency range (Italy only)
Set the stratup condition of the frequency range of the grid. You can set StartOF that is the upper limit of the renge, and StartUF that is the lower limit of the renge. If the gird frequency remains between StartOF and StartUF, KP100L starts connecting to the grid after waiting for reconnection time.

[36] Setup frequency limit of Active Power Control (Italy only)
Set the parameter of active power control.
Refer to section "3.6 Setting in Particular Countries" for detail.

[37] Setup startup frequency of Active Power Control (Italy only)
Set the parameter of active power control.
Refer to section "3.6 Setting in Particular Countries" for detail.

■ Check Settings



In the mode of Check Settings, you can check the country setting, the compliant standard, each setting value that decision by the country setting,Auto Test results, the model name, the ROM version, the serial number. Refer to the follow list about the shown item. In the selection display, the display changes into the mode of Check Settings if you select "Check" and press the ENT key.
Change into the display of the item of next one by you press the ">>" key and change into the display of the item of previous one by you press the "<<" key.
Return to the first item display when you press the ">>" key while showing the last item. Change into the last item display when you press the "<<" key while showing the first item.
If you press the MODE key while which item is shown, the mode of Check Settings is ended and returns to the selection display.

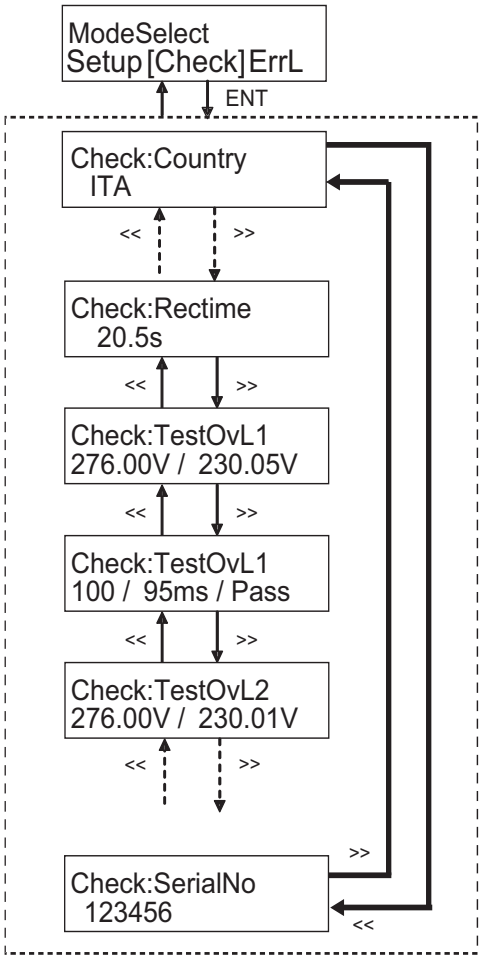
Name	Item Display	Unit
Country Setting	Country	-
Compliant Standard	Standard	-
Grid Connection to LV/MV network (ITA only)	GridVolt	-
DC Input connection (ITA only)	DC Input	
OV detect level	OV_Level	V
OV detect time	OV_Time	s
Voltage Rising detect level (GER, FRA, GRE, CZE, DEN, TUR)	V rise	V
UV detect level	UV_Level	V
UV detect time	UV_Time	s
OF detect level	OF_Level	Hz
OF detect time	OF_Time	s
UF detect level	UF_Level	Hz
UF detect time	UF_Time	s
PF mode (GER, DEN, ITA)	cos ϕ	-

Name	Item Display	Unit
Reactive Power Control mode (ITA LV only)	Q	-
Active Power Control mode (GER, DEN, ITA)	Freq Lim	-
Reconnection time	RecTime	s
Auto Test Results (ITA only)	Refer to next page	-
Model	Model	-
ROM Version	RomVer	-
Serial Number	SerialNo	-

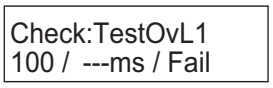
Auto Test Results

After executing Auto Test, you can check Auto Test results.
Refer to p. 3-14 “User's setup” to execute Auto Test.

Procedure for checking of the Auto Test results is as follows.
When the display shows “RecTime”, press the ">>" key to show Auto Test results.
First, you can check the test result of OV[L1]. The display shows “threshold values set in the Interface Protection (PI)” and “actual values at which the Interface Protection intervened”. Change into the next item by you press the ">>" key, then you can check “times at which the Interface Protection (PI) commanded to the Interface Device (DI) to open” and the test result (Pass/ Fail).
Next change into the next item by you press the ">>" key, you can check the test result of OV[L2].
You can check all Auto Test results by you press the ">>" key.

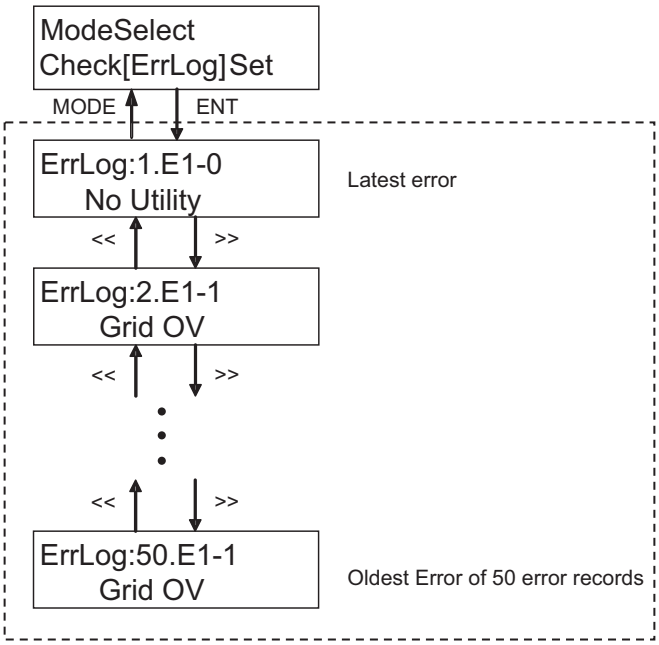


When Auto Test is failed,
display shows as following.

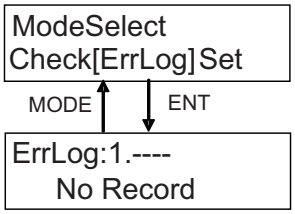


■ Error Logging (Menu:ErrLog)

In the display of Error Logging, the content of the error that occurred in the past are shown up to 50. The serial number and the error code are shown in the Display [2] and the content of the error is shown in the Display [3]. An old Error Logging is displayed when you press the ">>" key and a new Error Logging is shown when you press the "<<"key.



The following is shown when there is no Error Logging.



3.6 Setting in Particular Countries

This section explains a setting different in each country.

■ Setting of Italy

This section explains the setting when the country setting is Italy.

Procedure of the Auto Test

Outline

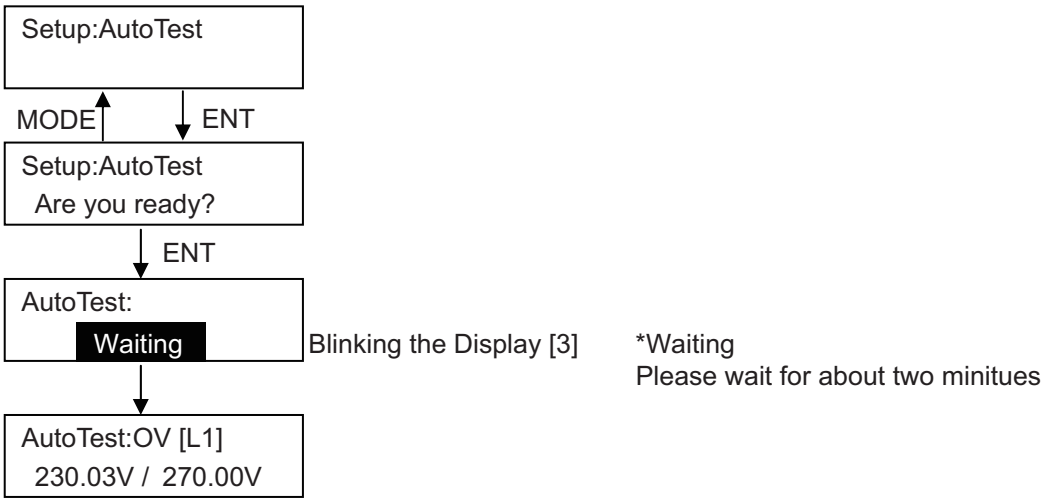
This inverter has an automatic test function which is compliant with ENEL guideline. The function checks each protective function of OV(Over Voltage), UV(Under Voltage), OF(Over Frequency) and UF(Under Frequency). Detect level and detect the time are shown on LCD.

Execute the Auto Test in grid-connected condition. If you don't connect grid and start Auto test, you can not finish Auto Test.

Grid-connected operation is started automatically after the test. The starting procedures for the Auto Test and sequences during the test are as follows.

The starting procedures for Auto Test

The Auto Test in the item of the user setting starts by you are selected and executed.



But, the Auto Test will not be started at the following conditions.

- When KP100L breaks down.
- When DC Power of Solar modules has not reached the amount that running is possible

Broad outline of sequences during the Auto Test

Broad outline of sequences during the Auto Test are shown below. The Auto Test is executed OV, UV, OF, UF, in that order.

(1) The inverter turns ON the inside Grid-connected relay.

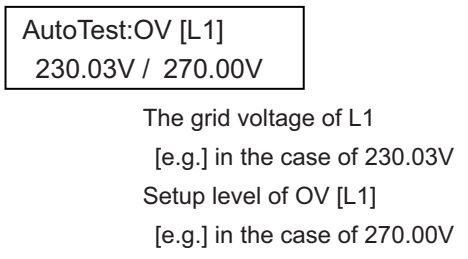
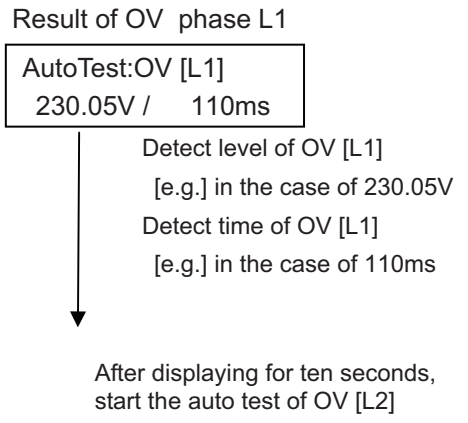
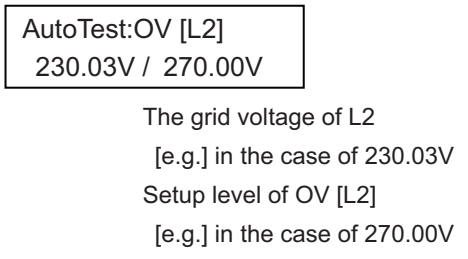
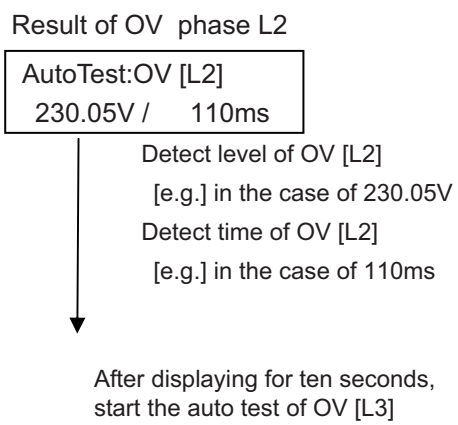
(2) Increase or decrease the set value.
OV: Decrease at the point 0.5V/s
UV: Increase at the point of 0.5V/s
OF: Decrease at the point of 0.05Hz/s
UF: Increase at the point of 0.05Hz/s

(3) Grid-connected relays are disconnected, when OV detect level keeps below the grid voltage for more than OV detect time
Grid-connected relays are disconnected, when UV detect level keeps above the grid voltage for more than UV detect time
Grid-connected relays are disconnected, when OF detect level keeps below the grid frequency for more than OF detect time
Grid-connected relays are disconnected, when UF detect level keeps above the grid frequency for more than UF detect time

(4) Detect level and detect the time are shown for ten seconds on LCD.

(5) After the test, grid-connected operation is started automatically and normal dispaly is shown.

Details of sequences during the Auto Test

Items	Sequences during the auto test	LCD
(1) The Auto Test of OV [L1]	(1-1)The inverter turns on the inside Grid-connected relay (1-2)Detect level of OV [L1] is decreased at the point of 0.5V/s (1-3)Grid-connected relays are disconnected, when OV [L1] detect level keeps below the grid voltage for more than OV [L1] detect time	
	(1-4)Detect level and detect time of OV [L1] detected in (1-3) are shown. (Display for ten seconds.)	
(2) The Auto Test of OV [L2]	(2-1)The inverter turns on the inside Grid-connected relay (2-2)Detect level of OV [L2] is decreased at the point of 0.5V/s (2-3)Grid-connected relays are disconnected, when OV [L2] detect level keeps below the grid voltage for more than OV [L2] detect time	
	(2-4)Detect level and detect time of OV [L2] detected in (2-3) are shown. (Display for ten seconds.)	

Items	Sequences during the auto test	LCD
(3) The Auto Test of OV [L3]	(3-1)The inverter turns on the inside Grid-connected relay (3-2)Detect level of OV [L3] is decreased at the point of 0.5V/s (3-3)Grid-connected relays are disconnected, when OV [L3] detect level keeps below the grid voltage for more than OV [L3] detect time	AutoTest:OV [L3] 230.03V / 270.00V The grid voltage of L3 [e.g.] in the case of 230.03V Setup level of OV [L3] [e.g.] in the case of 270.00V
	(3-4)Detect level and detect time of OV [L3] detected in (3-3) are shown. (Display for ten seconds.)	Result of OV phase L3 AutoTest:OV [L3] 230.05V / 110ms Detect level of OV [L3] [e.g.] in the case of 230.05V Detect time of OV [L3] [e.g.] in the case of 110ms After displaying for ten seconds, start the auto test of UV [L1]
(4) The Auto Test of UV [L1]	(4-1)The inverter turns on the inside Grid-connected relay (4-2)Detect level of UV [L1] is increased at the point of 0.5V/s (4-3)Grid-connected relays are disconnected, when UV [L1] detect level keeps above the grid voltage for more than UV [L1] detect time	AutoTest:UV [L1] 230.02V / 184.00V The grid voltage of L1 [e.g.] in the case of 230.02V Setup level of UV [L1] [e.g.] in the case of 184.00V
	(4-4)Detect level and detect time of UV [L1] detected in (4-3) are shown. (Display for ten seconds.)	Result of UV phase L1 AutoTest:UV [L1] 230.04V / 110ms Detect level of UV [L1] [e.g.] in the case of 230.04V Detect time of UV [L1] [e.g.] in the case of 110ms After displaying for ten seconds, start the auto test of UV [L2]

Items	Sequences during the auto test	LCD
(5) The Auto Test of UV [L2]	(5-1)The inverter turns on the inside Grid-connected relay (5-2)Detect level of UV [L2] is increased at the point of 0.5V/s (5-3)Grid-connected relays are disconnected, when UV [L2] detect level keeps above the grid voltage for more than UV [L2] detect time	AutoTest:UV [L2] 230.02V / 184.00V The grid voltage of L2 [e.g.] in the case of 230.02V Setup level of UV [L2] [e.g.] in the case of 184.00V
	(5-4)Detect level and detect time of UV [L2] detected in (5-3) are shown. (Display for ten seconds.)	Result of UV phase L2 AutoTest:UV [L2] 230.04V / 110ms Detect level of UV [L2] [e.g.] in the case of 230.04V Detect time of UV [L2] [e.g.] in the case of 110ms After displaying for ten seconds, start the auto test of UV [L3]
(6) The Auto Test of UV [L3]	(6-1)The inverter turns on the inside Grid-connected relay (6-2)Detect level of UV [L3] is increased at the point of 0.5V/s (6-3)Grid-connected relays are disconnected, when UV [L3] detect level keeps above the grid voltage for more than UV [L3] detect time	AutoTest:UV [L3] 230.02V / 184.00V The grid voltage of L3 [e.g.] in the case of 230.02V Setup level of UV [L3] [e.g.] in the case of 184.00V
	(6-4)Detect level and detect time of UV [L3] detected in (6-3) are shown. (Display for ten seconds.)	Result of UV phase L3 AutoTest:UV [L3] 230.04V / 110ms Detect level of UV [L3] [e.g.] in the case of 230.04V Detect time of UV [L3] [e.g.] in the case of 110ms After displaying for ten seconds, start the auto test of OF

Items	Sequences during the auto test	LCD
(7) The Auto Test of OF	(7-1)The inverter turns on the inside Grid-connected relay (7-2)Detect level of OF is decreased at the point of 0.05Hz/s (7-3)Grid-connected relays are disconnected, when OF detect level keeps below the grid voltage for more than OF detect time	AutoTest:OF 50.00Hz / 50.30Hz The frequency of the grid [e.g.] in the case of 50.00Hz Setup level of OF [e.g.] in the case of 50.30Hz
	(7-4)Detect level and detect time of OF detected in (7-3) are shown. (Display for ten seconds.)	Result of OF AutoTest:OF 50.01Hz / 90ms Detect level of OF [e.g.] in the case of 50.01Hz Detect time of OF [e.g.] in the case of 90ms After displaying for ten seconds, start the auto test of UF
(8) The Auto Test of UF	(8-1)The inverter turns on the inside Grid-connected relay (8-2)Detect level UF is increased at the point of 0.05Hz/s (8-3)Grid-connected relays are disconnected, when UF detect level keeps above the grid voltage for more than UF detect time	AutoTest:UF 50.00Hz / 49.70Hz The frequency of the grid [e.g.] in the case of 50.00Hz Setup level of UF [e.g.] in the case of 49.70Hz
	(8-4)Detect level and detect time of UF detected in (8-3) are shown. (Display for ten seconds.)	Result of UF AutoTest:UF 49.99Hz / 90ms Detect level of UF [e.g.] in the case of 49.99Hz Detect time of UF [e.g.] in the case of 90ms After displaying for ten seconds, grid-connected operation is started automatically and normal display is shown.

Error of Auto Test

The measurement becomes impossible when the power failure etc. occur, the LCD display shows "Example 1" , so the Auto Test error "E5-9 AutoTestFault" occurs, and KP100L stops. Afterwards, you can execute Auto Test again according to the procedure of **"The starting procedures for Auto Test"**.

[Example 1]

```
AutoTest:UF
  ---    /     ---
```

Report of Auto Test results

You can check Auto Test results with LCD display by changing into the mode of “Check Settings” in “Mode Selection Display".

Refer to p.3-26 “Auto Test Results”.

Reactive power control (LV only)

KP100L can provide controlled reactive power to grid in one of four modes.

(a) External power factor command or reactive power command

(b) Power factor curve according to output active power : $\cos\phi$ =f(P)

(c) Reactive power curve according to output voltage : Q=f(V)

(d) Fixed value of power factor command or reactive power command

(a) External power factor command or reactive power command

According to the external power factor command or reactive power command from external controller via RS485, KP100L provides controlled reactive power.

Setting contents

Item	display	Set Value	Mean
Setup mode of Reactive Power Control	Q	1.000	Recieve external command of power factor
		percent	Recieve external command of reactive power

(b) Power factor curve according to output active power : cos ϕ =f(P)

According to the output active power of KP100L, KP100L provides controlled reactive power.

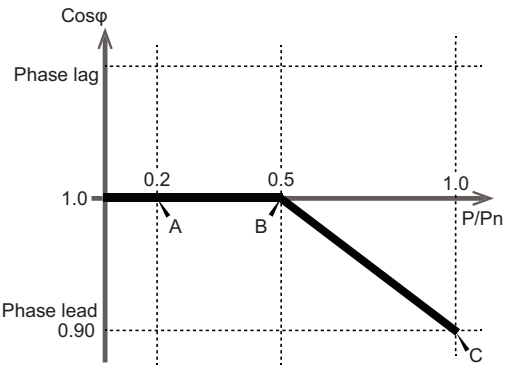
This mode can be set from the display.

Setting contents

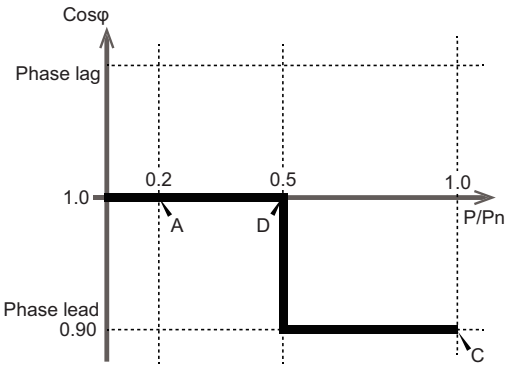
Item	display	Set Value	Mean
Setup mode of Reactive Power Control	Q	AUTO CEI	cos ϕ =f(P) with lock-in/out voltage
		AUTO 0.95	fixed cos ϕ (Max0.95) curve without lock-in/out voltage
		AUTO 0.90	fixed cos ϕ (Max0.90) curve without lock-in/out voltage
Lock In Voltage	LockInV	100 to 110	voltage level enabling cos ϕ =f(P)
Lock Out Voltage	LockOutV	90 to 100	voltage level disabling cos ϕ =f(P)
Auto CEI Point A	Point A	5 to 100	Refer to the picture of AUTO CEI
Auto CEI Point B	Point B	5 to 100	Refer to the picture of AUTO CEI * When you set the Point D equal to 5% (default value), the Point B is valid.
Auto CEI Point C	Point C	0.90 to 1.00	Refer to the picture of AUTO CEI
Auto CEI Point D	Point D	5 to 100	Refer to the picture of AUTO CEI * When you set the Point D equal to 5%(default value),the Point D is invalid. When you set the Point D more than 6%(not equal to default value), the Point D is valid.

AUTO CEI

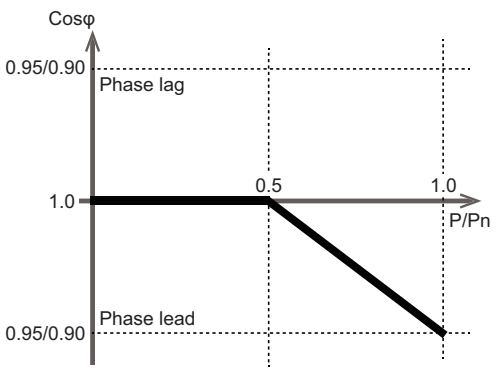
When AUTO CEI is activated with all default values



When AUTO CEI is activated with the following condition
Point A = 20%, Point C = 0.9, Point D = 50%



AUTO 0.95/ AUTO 0.90

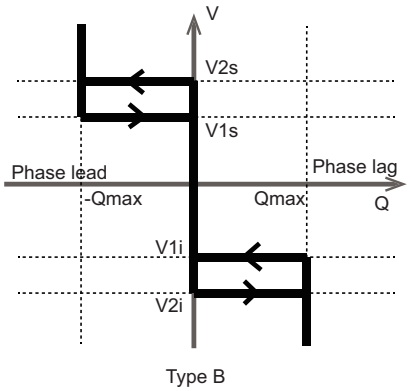


(c) Reactive power curve according to output voltage : Q=f(V)

According to the output voltage of KP100L, KP100L provides controlled reactive power.
This mode can be set from the display.

Setting contents

Item	display	Set Value	Mean
Reactive power setting	Q	Type B	Type B of Q=f(V) Mode
Lock In Power	LockInP	10 to 100	active power level enabling Q=f(V)
v1s	V1s	100 to 110	Refer to the picture of Q=f(V)
v2s	V2s	100 to 110	Refer to the picture of Q=f(V)
v1i	V1i	90 to 100	Refer to the picture of Q=f(V)
v2i	V2i	90 to 100	Refer to the picture of Q=f(V)



Type B

(d) Fixed value of power factor command or reactive power command

KP100L provides fixed value of reactive power.

Power factor can be set up between the leading phase 0.85 and the lagging phase 0.90.

Reactive power can be set up between the leading phase 50%and the lagging phase 50%.

This mode can be set from the display.

Setting contents

Item	display	Set Value	Lead / Lag	Mean
Setup mode of Reactive Power Control	Q	D 0.975	Leadding phase	PF 0.975 constant
		D 0.950	Leadding phase	PF 0.950 constant
		D 0.925	Leadding phase	PF 0.925 constant
		D 0.900	Leadding phase	PF 0.900 constant
		D 0.875	Leadding phase	PF 0.875 constant
		D 0.850	Leadding phase	PF 0.850 constant
		G 0.975	Lagging phase	PF 0.975 constant
		G 0.950	Lagging phase	PF 0.950 constant
		G 0.925	Lagging phase	PF 0.925 constant
		G 0.900	Lagging phase	PF 0.900 constant
		D 5	Leading phase	reactive power:5% constant
		D 10	Leading phase	reactive power:10% constant
		D 15	Leading phase	reactive power:15% constant
		D 20	Leading phase	reactive power:20% constant
		D 25	Leading phase	reactive power:25% constant
		D 30	Leading phase	reactive power:30% constant
		D 35	Leading phase	reactive power:35% constant
		D 40	Leading phase	reactive power:40% constant
		D 45	Leading phase	reactive power:45% constant
		D 50	Leading phase	reactive power:50% constant
		G 5	Lagging phase	reactive power:5% constant
		G 10	Lagging phase	reactive power:10% constant
		G 15	Lagging phase	reactive power:15% constant
		G 20	Lagging phase	reactive power:20% constant
		G 25	Lagging phase	reactive power:25% constant
		G 30	Lagging phase	reactive power:30% constant
		G 35	Lagging phase	reactive power:35% constant
		G 40	Lagging phase	reactive power:40% constant
		G 45	Lagging phase	reactive power:45% constant
		G 50	Lagging phase	reactive power:50% constant

Active power control

KP100L can provide controlled active power to grid in two modes.

(a) External active power command

(b) Active power regulation at overfrequency

While the active power control is operating, the value of AC Power blinks in the Display.

(a) External active power command

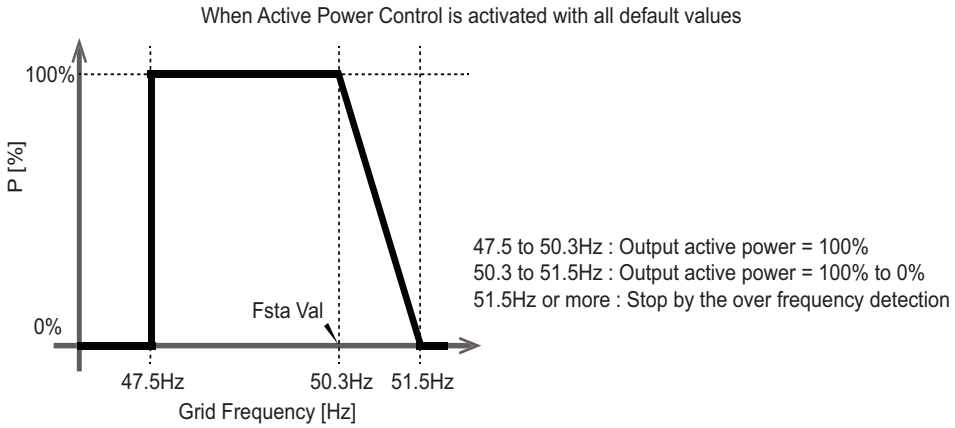
According to the external command of the active current via RS485, the output active power of the KP100L is reduced.

(b) Active power regulation at overfrequency

The output active power of KP100L is reduced between 50.3Hz and 51.5Hz (all default values). This mode, the frequency limit and startup frequency can be set from the display.

Setting contents

Item	display	Set Value	Mean
Setup mode of Active Power Control	Freq Lim	OFF	Disable
		ON	Enable
Setup frequency limit of Active Power Control	Flim Val	2.0 to 5.0	Parameter of Frequency limit Frequency limit[Hz] = "Fsta Val"+ (50.0 * "Flim Val"/100) When "Fsta Val" is 50.3 and "Flim Val" is 2.4 (all default values), the frequency limit is 51.5Hz.
Setup startup frequency of Active Power Control	Fsta Val	50.00 to 52.00	Startup Frequency



DC Input Connection

You have to set DC input connection to KP100L manually.

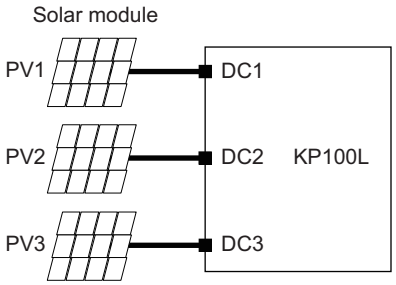
Check the DC input connection in your system, select the value correctly corresponding to your system.

(Notes) If you set the DC input connection incorrectly, the output power of KP100L might decrease.

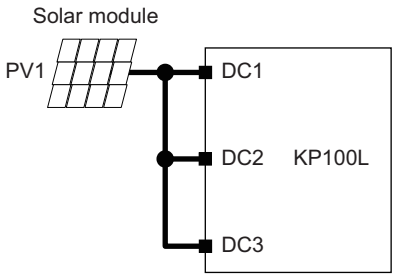
Setting contents

Item	display	Set Value	Mean
Setup of DC Input connection (ITA only)	DC Input	DC1+DC2+ DC3	Multi (independent) input of all
		DC1//DC2// DC3	Single (parallel) input of all
		DC1//DC2+ DC3	Multi (independent) input of DC3 and single (parallel) input of DC1 and DC2
		DC1+DC2// DC3	Multi (independent) input of DC1 and single (parallel) input of DC2 and DC3
		DC1//DC3+ DC2	Multi (independent) input of DC2 and single (parallel) input of DC1 and DC3

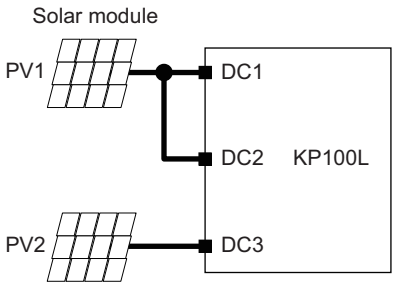
* If you use 2 DC inputs, you can use the value of "DC1+DC2+DC3"for multi (independent) input and the value of "DC1//DC2//DC3" for single (parallel) input.



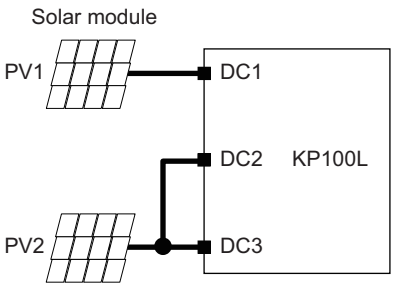
Multi (independent) input of all:
DC1+DC2+DC3



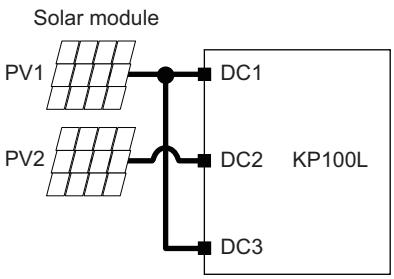
Single (parallel) input of all:
DC1//DC2//DC3



Multi (independent) input of DC3 and single (parallel) input of DC1 and DC2:
DC1//DC2+DC3

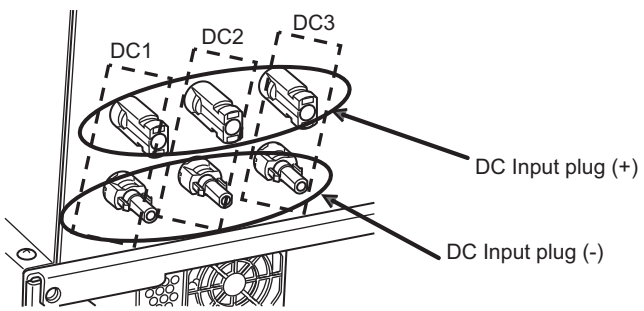


Multi (independent) input of DC1 and single (parallel) input of DC2 and DC3:
DC1+DC2//DC3



Multi (independent) input of DC2 and single (parallel) input of DC1 and DC3:
DC1//DC3+DC2

Number of DC input of KP100L (Refer to section "1.3 Appearance and Names of Parts" for detail.)



■ Setting of Germany and Denmark

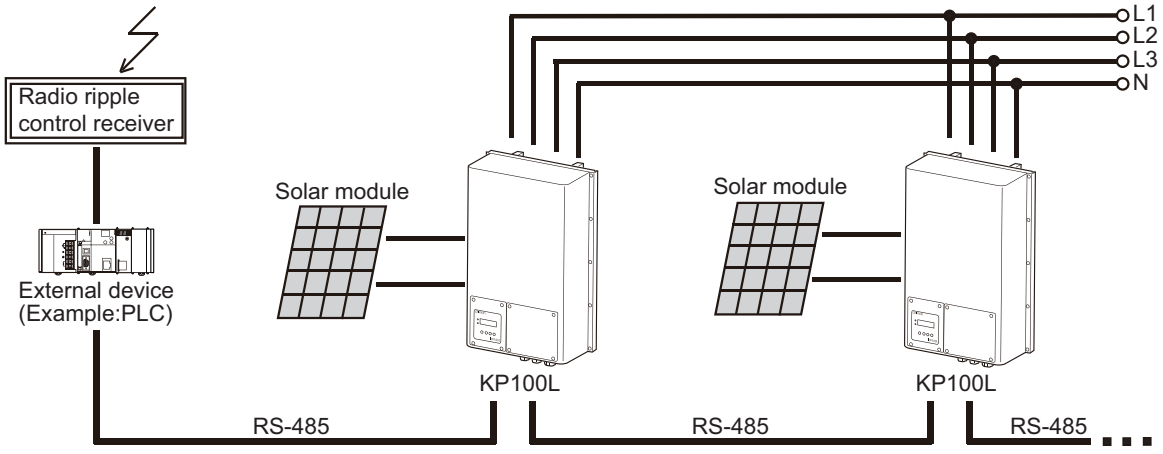
This section explains the setting when the country setting is Germany and Denmark.

About VDE-AR-N-4105

To avoid grid-relevant problems in the low-voltage network, VDE-AR-N-4105 was prepared in 2011. VDE-AR-N4105 shows requirements that have to be take into consideration. The following 1] ~ 3] are required in the VDE-AR-N-4105.

1) Active power control
2) Reactive power control
3) Active power feed-in at overfrequency

KP100L system configuration for VDE-AR-N-4105 is shown below.



Active power control

According to the external command of the active current via RS485, the output active power of the KP100L is reduced.

Reactive power control

KP100L can provide controlled reactive power to grid in one of three modes.

(a) External phase command
(b) Power factor curve according to output active power : cos ϕ (P)
(c) Fixed value of power factor command

(a) External phase command

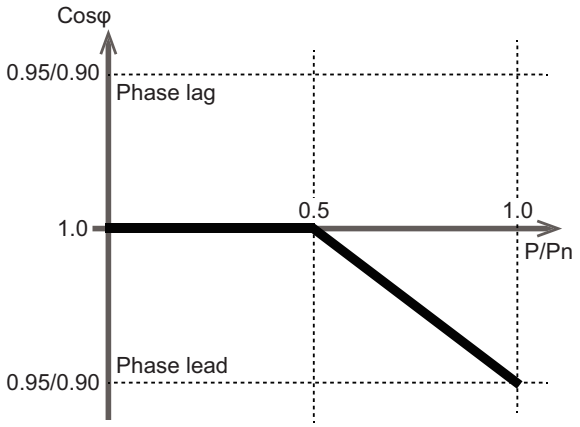
According to the external phase command from external controller via RS485, KP100L provides controlled reactive power.

(b) Power factor curve according to output active power : cos ϕ (P)

According to the output active power of KP100L, KP100L provides controlled reactive power.
This mode can be set from the display.

Setting contents

Item	display	Set Value	Mean
PF command according to output active power	cos ϕ	AUTO 0.95	AUTO(Max0.95)
		AUTO 0.90	AUTO(Max0.90)



(C) Fixed value of power factor command

Regardless of the output active power of KP100L, KP100L provides fixed value of reactive power.
Power factor can be set up between the leading phase 0.85 and the lagging phase 0.95.
This mode can be set from the display.

Setting contents

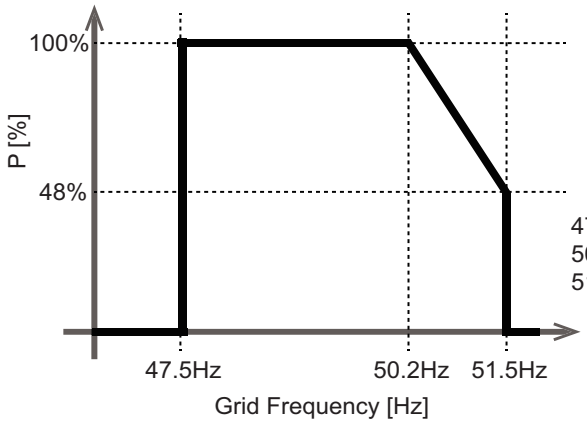
Item	display	Set Value	Lead / Lag	Mean
Setup mode of Power Factor (PF)	cos ϕ	D 0.975	Leadding phase	0.975 constant
		D 0.950	Leadding phase	0.950 constant
		D 0.925	Leadding phase	0.925 constant
		D 0.900	Leadding phase	0.900 constant
		D 0.875	Leadding phase	0.875 constant
		D 0.850	Leadding phase	0.850 constant
		G 0.975	Lagging phase	0.975 constant
		G 0.950	Lagging phase	0.950 constant

Active power feed-in at overfrequency

The output active power of KP100L is reduced between 50.2Hz and 51.5Hz.
This mode can be set from the display.

Setting contents

Item	display	Set Value	Mean
Setup mode of Active Power Control	Freq Lim	OFF	Disable
		ON	Enable



47.5 to 50.2Hz : Output active power = 100%
50.2 to 51.5Hz : Output active power = 100% to 48%
51.5Hz or more : Stop by the over frequency detection

■ Setting of Greece

This section explains the setting when the country setting is Greece.

Change of Detect level

The detect level of OF/UF can be changed according to the detect level change menu of the user setting as follows. The setting should be adapted to grid frequency that is different in area of Greece.

Setting	OF/UF Detect level
0	50.50Hz (OF-Detect level) 49.50Hz (UF-Detect level)
1	51.00Hz (OF-Detect level) 47.50Hz (UF-Detect level)

■ Detect level of Each Country

The detect level (default value) of each country is the following. These level are set under consideration of regulation value , tolerance, and detection time.
The detect level cannot be changed excluding the OF/UF level of Greece.

Set value item		Germany	Spain	Italy	France	Greece	Czech	Denmark	Portugal	Turkey	RSA	Korea
OV	Level [V]	264.50	253.00	264.50	264.50	264.50	264.50	264.5	253.00	264.50	249.80	242.00
	Time [s]	0.15	4.90	0.20	0.15	0.45	0.15	0.15	4.90	0.15	599.90	1.00
V Rising	Level [V]	253.00	N/A	N/A	253.00	253.00	253.00	253.00	N/A	253.00	N/A	N/A
UV	Level [V]	184.00	195.50	195.50	195.50	184.00	195.50	184.00	195.50	184.00	209.60	193.6
	Time [s]	0.15	4.90	0.40	0.15	0.45	0.15	0.15	4.90	0.15	599.90	1.00
OF	Level [Hz]	51.50	50.90	51.50	50.50	50.50	50.50	50.15	50.90	50.15	51.45	60.5
	Time [s]	0.15	4.90	0.10(LV) / 1(MV) (*3)	0.15	0.45	0.15	0.15	4.90	0.15	59.90	0.10
UF	Level [Hz]	47.50	49.10	47.50	49.50	49.50	49.50	48.50	49.10	48.50	48.55	59.3
	Time [s]	0.15	4.90	0.10(LV) / 4(MV) (*3)	0.15	0.45	0.15	0.15	4.90	0.15	59.90	0.10
Reconnection time [s]		5.5(*1)	180.5 (*2)	300	5.5(*1)	180.5 (*2)	5.5(*1)	5.5(*1)	180.5 (*2)	5.5(*1)	5.5(*1)	300

*1 Before connecting the grid, it is examined if the voltage and frequency of the grid remains within the tolerance area pursuant to VDE0126-1-1 4.2.1, 4,2,2 and 4.3 for 30 seconds. The connection and feeding cannot be carried out unless voltage and frequency of the grid remain within the tolerance pursuant to VDE0126-1-1 4.2 and 4.3 for 5 seconds.

*2 Before connecting the grid, it is examined if the voltage and frequency of the grid remains within the tolerance for 30 seconds.

*3 The detection time is different corresponding to grid connection to LV/MV.

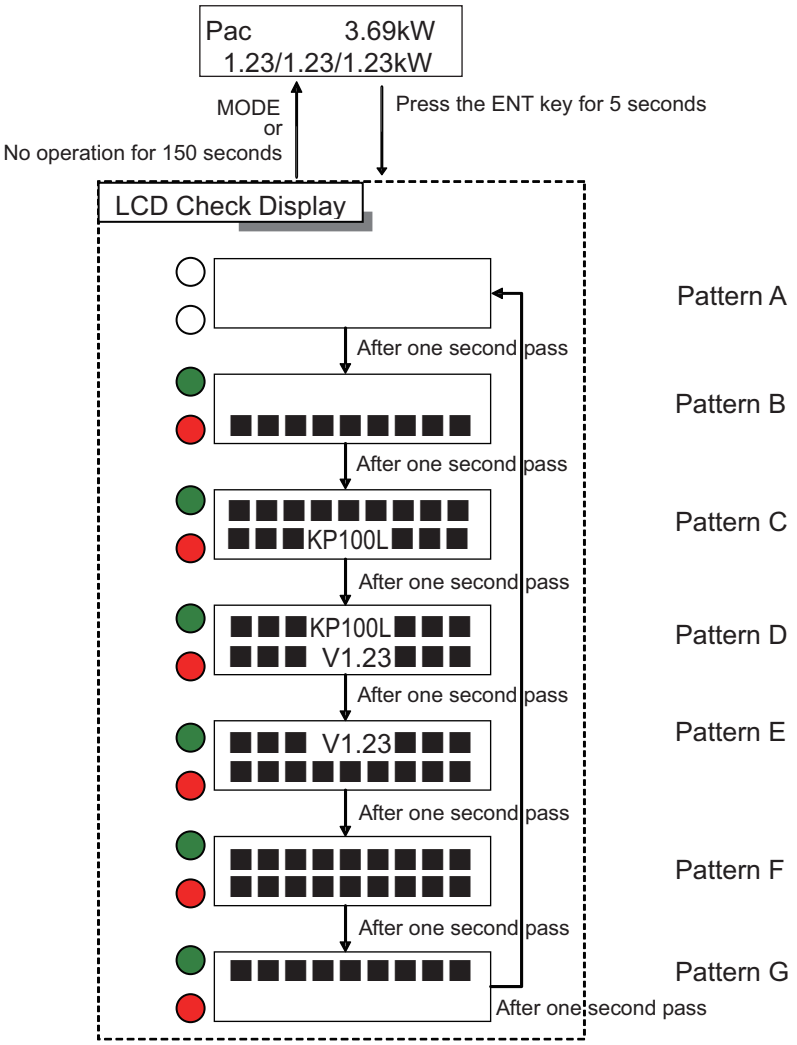
"The detect level" and "the detect time" of "OF" and "UF" of South Africa are the master value. In the design, "OF", and "UF" are detected by following "the detect level" and "the detect time".

Set value item	Level[Hz]	Time[s]
OF	51.45 or more	Within 59.9
	51.95 or more	Within 9.9
	53.95 or more	Within 0.9
UF	48.55 or less	Within 59.9
	48.05 or less	Within 9.9
	47.55 or less	Within 5.9
	46.05 or less	Within 0.9

3.7 Confirm method of LCD display

This function is used as a function to judge whether it is a breakdown of LCD, if LCD is not displayed.
The display changes into the checking display of the LCD when you press the ENT key for 5 seconds while shown normal display or error display. The following figure is displayed for checking the breakdown of the display part. The LED (green, red) lights except Pattern A.

If LCD is not displayed during the checking display of the LCD, LCD might be breakdown.
If LCD is displayed during the checking display of the LCD, there is cause that LCD is not displayed during operation.
Contact the store from which you purchased the product after checking display of the LCD according to this procedure.



4

Maintenance Operations

4.1 Outline of error 4-2
4.2 Remedy for errors 4-3
4.3 Buzzer 4-10
4.4 Troubleshooting 4-11

4.1 Outline of error

Refer to section "A.1 Error list" for detail of each error.

4.2 Remedy for errors

The following tables have described the method of measures to each error.

E1-0: No Utility

Situation	Inverter is not able to detect AC voltage.
Possible Cause	1. Grid is not available. 2. AC connection is not correct 3. AC switch between Inverter and utility is not ON. 4. AC fuse and/or breaker is open. 5. Inverter is abnormal.
Remedy for User	1. Make sure the breaker and switch on AC side are ON. Operation will restart automatically when the grid voltage returns to normal. 2. Check the AC wiring. 3. If the problem persists, contact the store from which you purchased the product or your installer.
Remedy for Professional (*1)	1. Make sure the breaker and switch on AC side are ON. 2. Check the AC wiring. 3. If the problem persists, please replace the Inverter.

*1 Professional means qualified person such as installers, electrical technicians, or service and maintenance engineers.

E1-1: Over voltage (Grid)

Situation	OV (AC over voltage) error due to rise of the grid voltage.
Possible Cause	1. The detected AC voltage is beyond the setting of Inverter. 2. AC connection is not correct. 3. Grid condition is weak or unstable. 4. Other high-power consumption device is affecting the grid system. 5. Inverter is abnormal.
Remedy for User	1. If this problem occurs seldom (such as 1 time a day), no action is necessary. Operation will restart automatically when the grid voltage returns to normal. If the problem occurs frequently, do the actions below. 2. Find the device with high power consumption near your AC system. 3. Consult your utility power supplier, understand the grid conditions. 4. Ask help of your installer.
Remedy for Professional	1. Check the system connection including polarities and security first. 2. Find the devices with high power consumption near the AC system. 3. Consult the utility power supplier, understand the grid conditions. 4. Use Inverter software to monitor the frequency and voltage. 5. If the situation is not improved, please replace the Inverter.

E1-2: Under voltage (Grid)

Situation	UV (AC under voltage) error due to drop of the grid voltage.
Possible Cause	1. The detected AC voltage is under the setting of Inverter. 2. AC connection is not correct. 3. Grid condition is weak or unstable. 4. Other high-power consumption device is affecting the grid system. 5. Inverter is abnormal.
Remedy for User	1. If this problem occurs seldom (such as 1 time a day), no action is necessary. Operation will restart automatically when the grid voltage returns to normal. If the problem occurs frequently, do the actions below. 2. Find the device with high power consumption near your AC system. 3. Consult your utility power supplier, understand the grid conditions. 4. Ask help of your installer.
Remedy for Professional	1. Check the system connection including polarities and security first. 2. Find the devices with high power consumption near the AC system. 3. Consult the utility power supplier, understand the grid conditions. 4. Use Inverter software to monitor the frequency and voltage. 5. If the situation is not improved, please replace the Inverter.

E1-3: Over frequency (Grid)

Situation	OF (over frequency) error due to rise of the grid frequency.
Possible Cause	1. The detected AC frequency is beyond the setting of Inverter. 2. AC connection is not correct. 3. Grid condition is weak or unstable. 4. Other high-power consumption device is affecting the grid system. 5. Inverter is abnormal.
Remedy for User	1. If this problem occurs seldom (such as 1 time a day), no action is necessary. Operation will restart automatically when the grid voltage returns to normal. If the problem occurs frequently, do the actions below. 2. Find the device with high power consumption near your AC system. 3. Consult your utility power supplier, understand the grid conditions. 4. Ask help of your installer.
Remedy for Professional	1. Check the system connection including polarities and security first. 2. Find the devices with high power consumption near the AC system. 3. Consult the utility power supplier, understand the grid conditions. 4. Use Inverter software to monitor the frequency and voltage. 5. If the situation is not improved, please replace the Inverter.

E1-4: Under frequency (Grid)

Situation	UF (under frequency) error due to drop of the grid frequency.
Possible Cause	1. The detected AC frequency is under the setting of Inverter. 2. AC connection is not correct. 3. Grid condition is weak or unstable. 4. Other high-power consumption device is affecting the grid system. 5. Inverter is abnormal.
Remedy for User	1. If this problem occurs seldom (such as 1 time a day), no action is necessary. Operation will restart automatically when the grid voltage returns to normal. If the problem occurs frequently, do the actions below. 2. Find the device with high power consumption near your AC system. 3. Consult your utility power supplier, understand the grid conditions. 4. Ask help of your installer.
Remedy for Professional	1. Check the system connection including polarities and security first. 2. Find the devices with high power consumption near the AC system. 3. Consult the utility power supplier, understand the grid conditions. 4. Use Inverter software to monitor the frequency and voltage. 5. If the situation is not improved, please replace the Inverter.

E1-5: Islanding passive

Situation	Islanding operation detected by passive method due to error in the power from the grid.
Possible Cause	1. AC connection is not correct. 2. Grid condition is weak or unstable. 3. Other high-power consumption device is affecting the grid system. 4. Inverter is abnormal.
Remedy for User	1. If this problem occurs seldom (such as 1 time a day), no action is necessary. Operation will restart automatically when the grid voltage returns to normal. If the problem occurs frequently, do the actions below. 2. Find the device with high power consumption near your AC system. 3. Consult your utility power supplier, understand the grid conditions. 4. Ask help of your installer.
Remedy for Professional	1. Check the system connection including polarities and security first. 2. Find the devices with high power consumption near the AC system. 3. Consult the utility power supplier, understand the grid conditions. 4. Use Inverter software to monitor the frequency and voltage. 5. If the situation is not improved, please replace the Inverter.

E1-6: Islanding active

Situation	Islanding operation detected by active method due to error in the power from the grid.
Possible Cause	1. AC connection is not correct. 2. Grid condition is weak or unstable. 3. Other high-power consumption device is affecting the grid system. 4. Inverter is abnormal.
Remedy for User	1. If this problem occurs seldom (such as 1 time a day), no action is necessary. Operation will restart automatically when the grid voltage returns to normal. If the problem occurs frequently, do the actions below. 2. Find the device with high power consumption near your AC system. 3. Consult your utility power supplier, understand the grid conditions. 4. Ask help of your installer.
Remedy for Professional	1. Check the system connection including polarities and security first. 2. Find the devices with high power consumption near the AC system. 3. Consult the utility power supplier, understand the grid conditions. 4. Use Inverter software to monitor the frequency and voltage. 5. If the situation is not improved, please replace the Inverter.

E1-7: Over voltage instantly (Grid)

Situation	The grid voltage exceeds 280 V.
Possible Cause	1. AC connection is not correct. 2. Grid condition is weak or unstable. 3. Other high-power consumption device is affecting the grid system. 4. Inverter is abnormal.
Remedy for User	1. If this problem occurs seldom (such as 1 time a day), no action is necessary. Operation will restart automatically when the grid voltage returns to normal. If the problem occurs frequently, do the actions below. 2. Find the device with high power consumption near your AC system. 3. Consult your utility power supplier, understand the grid conditions. 4. Ask help of your installer.
Remedy for Professional	1. Check the system connection including polarities and security first. 2. Find the devices with high power consumption near the AC system. 3. Consult the utility power supplier, understand the grid conditions. 4. Use Inverter software to monitor the frequency and voltage. 5. If the situation is not improved, please replace the Inverter.

E1-8: Under voltage instantly (Grid)

Situation	The grid voltage drops below 110V.
Possible Cause	1. AC connection is not correct. 2. Grid condition is weak or unstable. 3. Other high-power consumption device is affecting the grid system. 4. Inverter is abnormal.
Remedy for User	1. If this problem occurs seldom (such as 1 time a day), no action is necessary. Operation will restart automatically when the grid voltage returns to normal. If the problem occurs frequently, do the actions below. 2. Find the device with high power consumption near your AC system. 3. Consult your utility power supplier, understand the grid conditions. 4. Ask help of your installer.
Remedy for Professional	1. Check the system connection including polarities and security first. 2. Find the devices with high power consumption near the AC system. 3. Consult the utility power supplier, understand the grid conditions. 4. Use Inverter software to monitor the frequency and voltage. 5. If the situation is not improved, please replace the Inverter.

E2-1: Over voltage (DC)

Situation	The detected PV voltage is higher than specification.
Possible Cause	1. The PV array voltage is too high. 2. Inverter is abnormal.
Remedy for User	1. If the fault continues, contact the store from which you purchased the product or your installer.
Remedy for Professional	1. Check the open PV voltage, and see if it is more than or too close to specification. 2. If PV voltage is much less than specification and the problem still occurs, please replace the Inverter.

E2-3: Ground I Fault

Situation	The fault current detected by the Inverter is higher than threshold.
Possible Cause	1. Obstacle, humidity or water exits between AC LINE and/or NEUTRAL to earth ground. 2. Obstacle, humidity or water exits between AC LINE and/or NEUTRAL to earth ground in the junction box. 3. The Insulation of AC wires is broken that could be bit by rat or any animals. 4. Inverter is abnormal.
Remedy for User	1. Disconnect AC connection of Inverter by opening AC switch. 2. Check the AC junction box and wiring of system. Clear obstacle ONLY IN SAFE CONDITIONS 3. Reconnect AC connection, check the status of Inverter. 4. If the problem persists, contact the store from which you purchased the product or your installer.
Remedy for Professional	1. Disconnect AC side of Inverter by opening AC switch. 2. Disconnect the DC side from the Inverter. 3. Check both the AC and DC wiring and insulation. 4. Reconnect AC connection, check the status of Inverter 5. If the problem persists, please replace the Inverter.

E2-4: Insulation resistance fault

Situation	Insulation resistance drops in the solar module equipment.
Possible Cause	1. PV array is abnormal. 2. The Insulation of PV wires is broken.
Remedy for User	1. Check the PV wiring 2. If the problem persists, contact the store from which you purchased the product or your installer.
Remedy for Professional	1. Check the PV wiring 2. If the problem persists, please replace the Inverter.

E3-4: Over Temperature

Situation	KP100L internal temperature is high.
Possible Cause	1. Ambient temperature is too high. 2. Heat dissipation problem 3. Inverter is abnormal.
Remedy for User	1. Make sure the ambient temperature of installation is less than 60°C. Operation will restart automatically when the temperature returns to normal. 2. Check the space near the heat sink. 3. Remove any obstacle that block the heat dissipation near heat sink 4. If the problem persists, contact the store from which you purchased the product or your installer.
Remedy for Professional	1. Make sure the ambient temperature of installation is less than 60°C. 2. Check the space near the heat sink. 3. Remove any obstacle that block the heat dissipation near heat sink. 4. If the problem persists, please replace the Inverter.

A2-5: Abnormality of fan

Situation	The rotational speed of the fan decreases below the threshold.
Possible Cause	1. Something is blocking the ventilation holes. 2. The end of life time of the fan. 3. The fan is abnormal.
Remedy for User	1. If something is blocking the heat sink, remove it. 2. If nothing is blocking the heat sink, the fan may have reached the end of its service life. Contact the store from which you purchased the product or your installer.
Remedy for Professional	1. If something is blocking heat sink, remove it. 2. If nothing is blocking heat sink, the fan may have reached the end of its service life. 3. Change the fan according to Chapter 5.

Other Errors

Situation	The KP100L detects an abnormality.
Possible Cause	
Remedy for User	1. Contact the store from which you purchased the product.
Remedy for Professional	

The main ground-fault breaker (RCD) trips frequently.

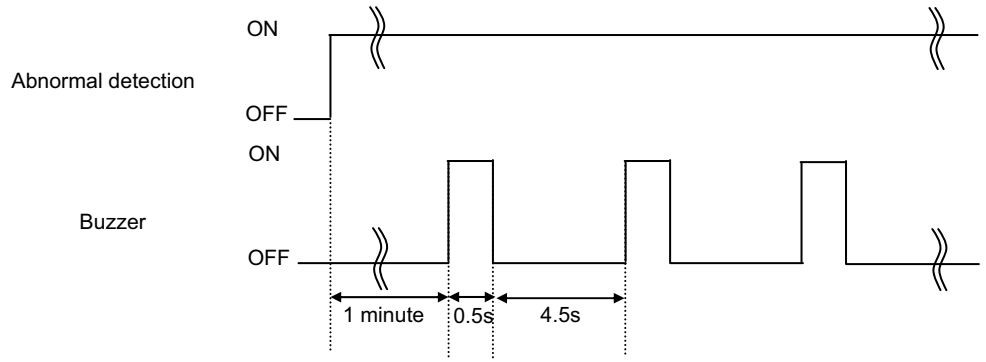
Situation	Ground faults are being caused by electrical appliances, the KP100L, or the solar modules.
Possible Cause	
Remedy for User	1. Check to make sure that the ground faults are not being caused by electrical appliances. 2. If no abnormalities are found, contact the store from which you purchased the product to measure the insulation resistance of the KP100L and the solar modules. Also describe the circumstances under which the problem happens (for example, the problem occurs on the morning after a rainy day, etc.).
Remedy for Professional	

4.3 Buzzer

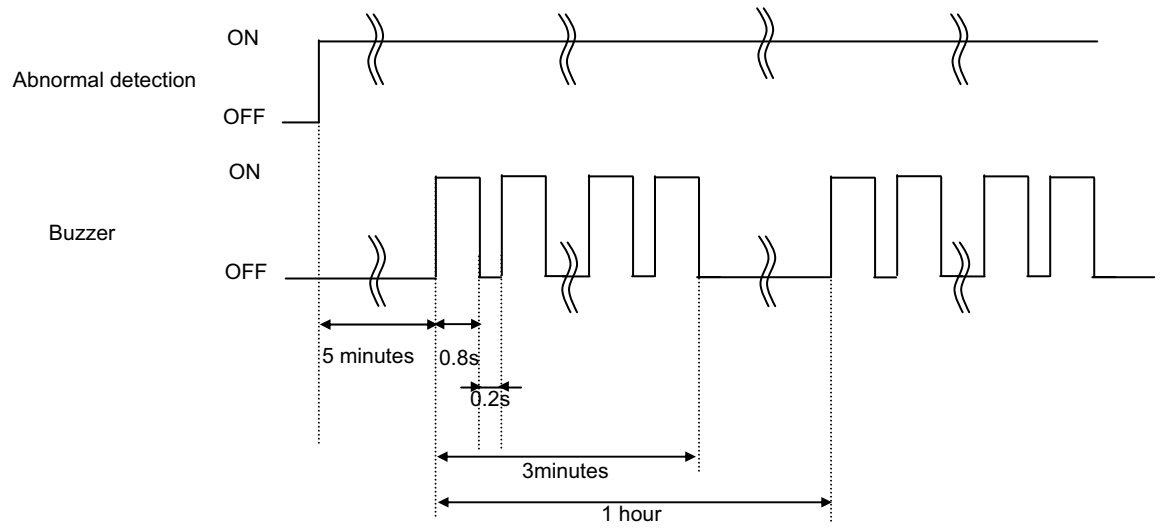
When the alarm sounds, KP100L detects an abnormality. There are two alarm sounds depending on the Error code as shown below.

Alarm sound 1	Alarm sound 2
E2-1, E2-3, E2-4,E3-4	E3-1, E3-2, E3-3,E4-1, E4-2, E4-3, E4-5, E4-6, E4-7, E5-1, E5-2, E5-4, E5-6,A2-5

(1)Alarm sound 1
If the KP100L is not installed correctly and this abnormal condition persists for more than 1 minute, the alarm generates the following signal.
Alarm is ON for 0.5 sec and OFF for 4.5 sec, this is repeated until the Inverter is shut down or the error is no longer present.



(2) Alarm sound 2
When the KP100L detects a defect or an abnormal condition and this condition persists for more than 5 minutes, the alarm generates the following signal. The alarm is ON for 0.8 sec and OFF for 0.2 sec, and this is repeated for 3minutes every hour.



4.4 Troubleshooting

Operation does not start immediately even though the DC input plugs are correctly connected.

- The power generation of the solar modules is insufficient. Operation will begin when the sunshine irradiation increases.

The operating indicators do not light up.

- The connectors are not correctly connected.

The power generation level is low even on a sunny day.

- The service life of the fan may have been reached, in which case the fan needs to be replaced.
- The Solar modules may be obstructed or shaded by something.
- The grid voltage may have risen. Contact the store from which you purchased the product.

5

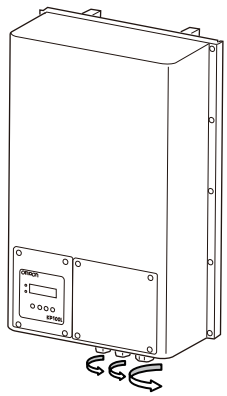
Inspection and Maintenance

5.1 Inspection and Maintenance 5-2
5.2 Storage 5-6

5.1 Inspection and Maintenance

Additionally tighten the cable clamp

The cable may thin slightly due to usage conditions. This requires that you additionally tighten the cable clamp regularly.



Additional tightening of the cable clamp

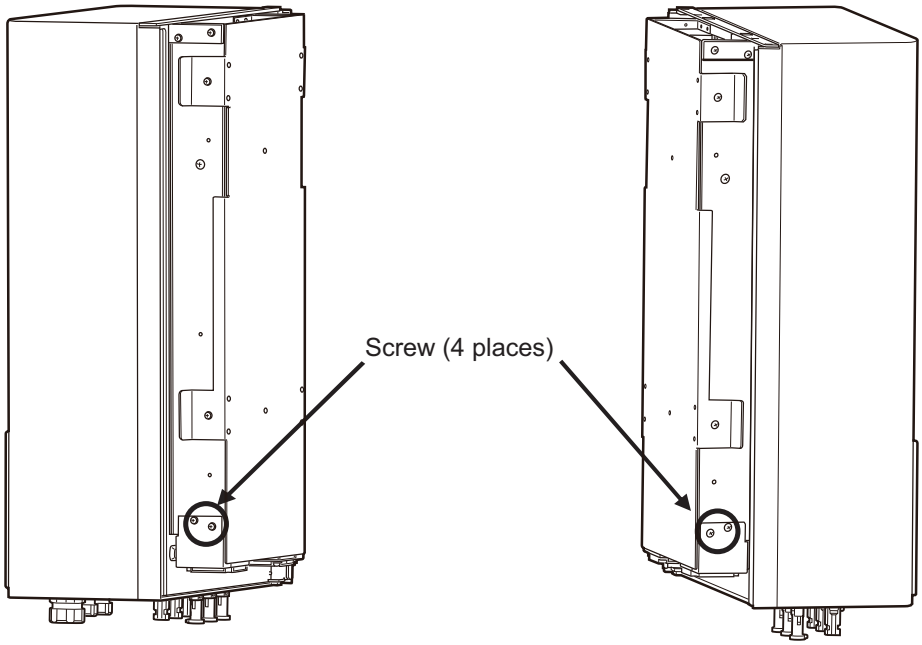
Exchanging Fans (FAN Assembly)

WARNING

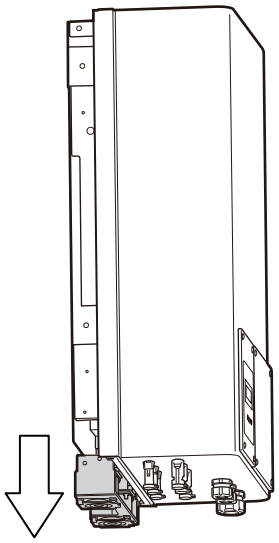
Functional lesion by injury and fire damage may possibly occur. Do not remove the MC cap on the back of the product when you exchange the FAN Assembly.

The exchange of FAN in the state set up is possible.

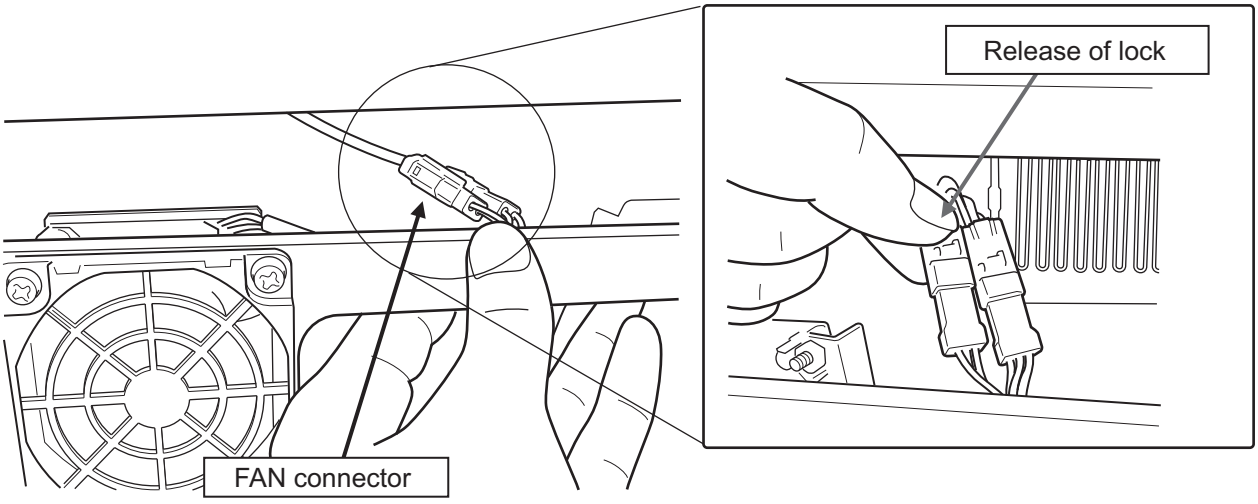
(1) The screw in 4 places is removed. Keep removed screws.



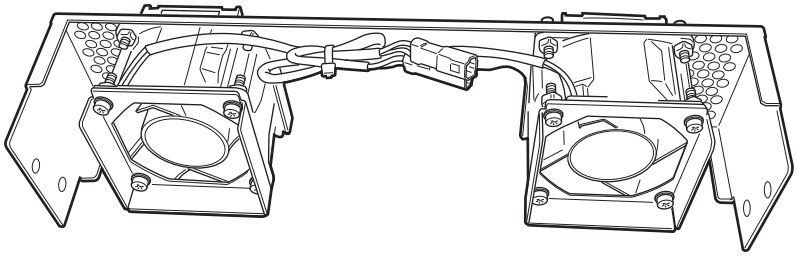
(2) Remove the FAN Assembly from the main body of the product.



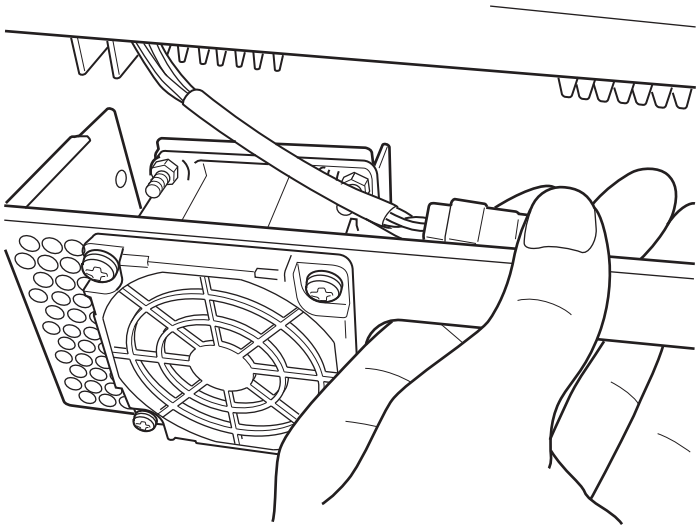
(3) Remove the FAN connector of the FAN Assembly.
Release the lock pushing the part shown in figure, and detach the relay connector.



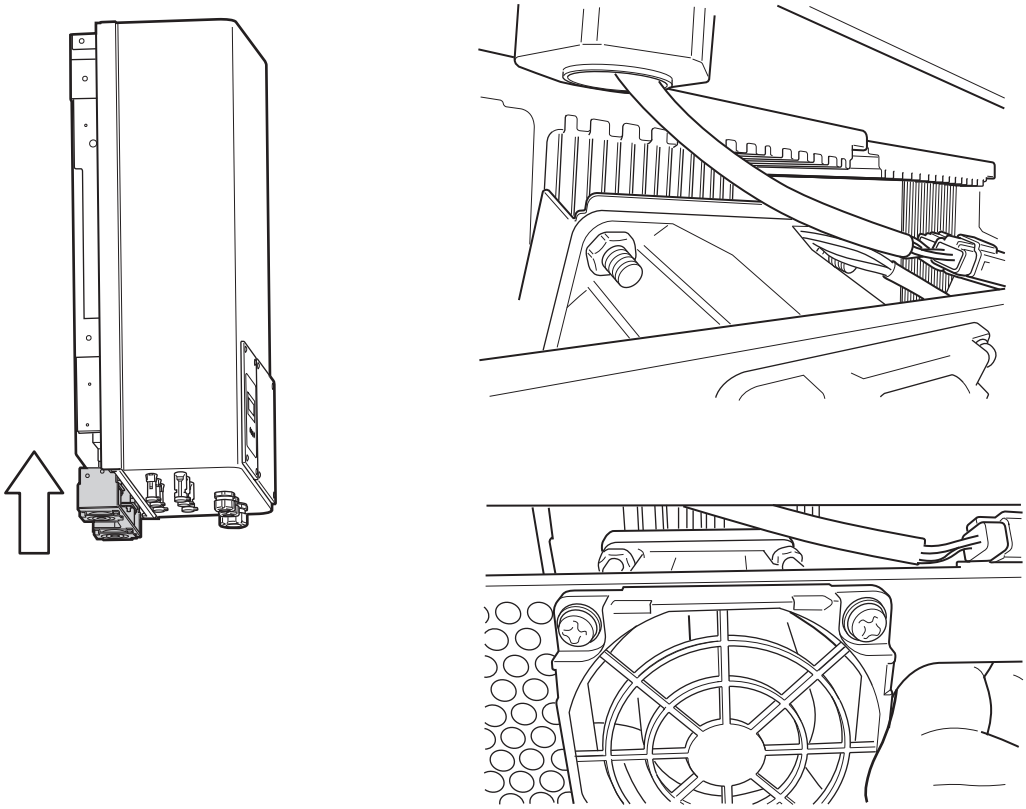
(4) Prepare new FAN Assembly.



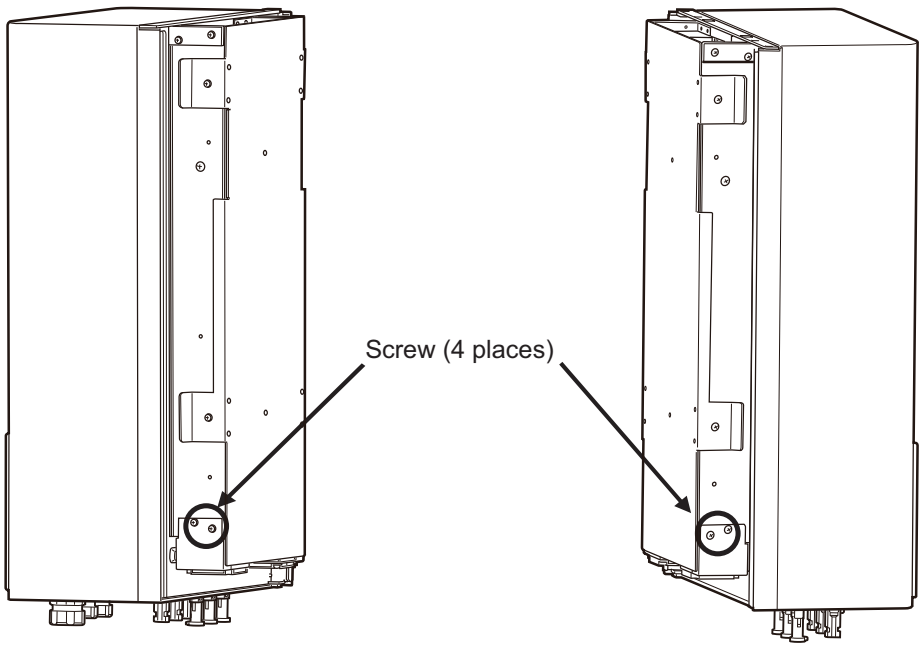
(5) Connect the FAN connector.



(6) Attach the FAN Assembly to the product.
Confirm the FAN wiring is not catch between the heatsink and the FAN Assembly.



(7) Fix the 4 screws.
(Tightening torque 1.5 to 1.7N•m)



5.2 Storage

- Ensure the follow conditions when storing the product temporarily or for a long term after purchase.
  Storage temperature : −25 to 60°C
  Humidity : 95% maximum
  (Without condensation or freezing due to rapid temperature change)
- Do not store this unit in a place with dust, direct sunshine, corrosive gas, or combustible gas.

6

After-Sales Service

6.1 After-Sales Service 6-2
6.2 Contact 6-3

6.1 After-Sales Service

In situations such as the following, stop the KP100L operation and contact the store from which you purchased the product.

- The KP100L is operating, but nothing is displayed.
- When the malfunction message show
- When the breaker trips frequently
- When a foreign object or liquid accidentally enters the product

When you contact the store, provide them with the following information:

- Your address, name and phone number
- Installed quantity
- Purchase date
- Inverter
  - Type
  - ROM Version (Firmware Version)
  - Serial number
  - Installation date
- Details of the problem (A description of the malfunction)
  - Please add any relevant details.
  - What does the display show?
  - Are there more inverters in the same installation?
  - Do the other inverters have failures?
  - Has it rained or have there been storms recently?
  - Have there been power cuts in the Low/Medium/High voltage grid system?
- PV panel model
- Measurements in DC side - Solar module
  - Measured DC voltage in each input
  - Are any of the protections tripped? Circuit breaker, fuses, residual current device, surge protection device?
- Measurements in AC side
  - Measured AC voltage
  - Measured AC voltage between Neutral and Earth
  - Are any of the protections tripped? Circuit breaker, fuses, residual current device, surge protection device?

6.2 Contact

■ Contact Address

Regional Headquarters
OMRON EUROPE B.V.
Wegalaan 67-69-2132 JD Hoofddorp
The Netherlands
Tel: +31 (0)23-5681300/Fax: +31 (0)23-5681388

OMRON Corporation
Environmental Solutions Business Headquarters
Energy Automation Department
2-2-1, Nishikusatsu, Kusatsu-city, Shiga, Pref.,525-0035 Japan

■ The Original Carton Box

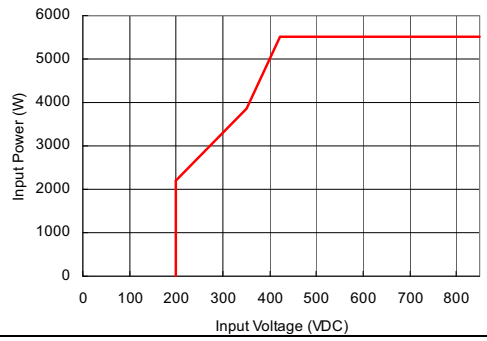
When it is necessary for you to send the KP100L to OMRON, please send the KP100L in the original carton box.

7

Specifications

7.1 Standard Specification List 7-2

7.1 Standard Specification List

Item				Specification
	Model name			**KP100L-OD-EU / EU-T**
DC Side	Max. input open-circuit voltage			850 VDC
	DC input voltage range			200 to 850 VDC
	MPPT voltage range	Rated power		320 to 825 VDC
		Operation power		200 to 850 VDC
	Nominal input voltage			585 VDC
	Max. input current per one pair of DC terminals			13 ADC
	Max. input power per one pair of DC terminals			5,500 W
				
	All pole disconnection on DC side			3 pairs of DC connectors (MC4)
	DC insulation resistance			1MΩ or more
	Personnel protection			Earth fault monitoring
AC Side	Output values (grid)	Nominal power	PAcnom	10,000 W
		Peak power (10 minutes)	Pacmax	11,000 W
		Nominal Output Current	IAC_nom	14.5A
	THD of output current			4% or less
	Output voltage range			230/400VAC −23.5% +20% (depends on protective functions)
	Nominal frequency			50Hz
	Output frequency range			45 to 55Hz
	Wiring system			3-phase 4-wire
	All pole disconnection, grid side			Mains monitoring with two independent allocated switching devices
	Over voltage Category			III
	Self-consumption during nighttime			1.5W or less
	Power Factor			1 (typical) (at output power 10kW) 0.95 or more (at output power 2kW)

Item			Specification
Other	External interfaces	Data transmission (electrically-isolated)	RS-232C/RS-485
		Input signal	Input voltage : 24V (Input current : 10mA)
		Relay outputs	NO contact : 2 250VAC,3A or 30VDC,3A(Resistance load)
	Standards	EMC	EN 61000-6-2 EN 61000-6-3 EN 61000-3-2
		Low voltage regulation	EN50178
		German regulation	VDE0126-1-1 VDE-AR-N-4105
		Spanish regulation	RD1663/2000
		Italian regulation	ENEL Guideline, CEI0-21, Terna A.70
	Enclosure	Degree of protection (acc. to DIN EN 60529)	Housing: IP65
	Dimensions and Weight	Dimensions (W x H x D)	455 x 700 x 270 mm
		Weight	Approx. 42 kg
	Ambient Conditions for Operation (*1)	Operating temperature range	–20 to 60°C
		Continuous nominal output power temperature range	–20 to 40°C
		Tolerable relative humidity	4 to 100%, none-condensing
	Efficiency	Max. efficiency	97.5%
		European efficiency	97.1%

*1 Ambient temperature is measured 10cm below of the inverter. There is few influence of self-heating from the inverter because wind of the FAN blow from lower side to upper side, then temperature 10cm below of the inverter is same as surrounding temperature of the inverter.

A

Appendix

A.1 Error list A-2
A.2 LCD messages (Local Language) A-4

A.1 Error list

The table below shows the list of Error and the content of the display of each error.

Error code	Content of error	Contents of display[3]	content of display[2]	Mode(AUX_OUT1) (Refer to [11] of P. 3 - 15)				
		Error name	error kind	1	2	3	4	5
E1-1	Over voltage (Grid)	Grid OV	Fault			*	*	
E1-2	Under voltage (Grid)	Grid UV	Fault			*	*	
E1-3	Over frequency (Grid)	Grid OF	Fault			*	*	
E1-4	Under frequency (Grid)	Grid UF	Fault			*	*	
E1-5	Islanding passive	IslandingPassive	Fault			*	*	
E1-6	Islanding active	IslandingActive	Fault			*	*	
E1-7	Over voltage instantly (Grid)	OV instantly	Fault			*	*	
E1-8	Under voltage instantly (Grid)	UV instantly	Fault			*	*	
E1-0	No Utility	No Utility	Fault			*	*	
E2-1	Over voltage (DC)	DCOverVolt	Fault		*		*	*
E2-3	Ground I fault	Ground I fault	Fault		*		*	*
E2-4	Insulation resistance fault	RISO fault	Fault		*		*	*
E3-1	Over Current (DC)	OverDcCurr	Failure	*			*	*
E3-2	Over Current (AC)	OverAcCurr	Failure	*			*	*
E3-3	Failure of inverter (DC current injection)	InvFail DcINJ	Failure	*			*	*
E3-4	Over temperature	Over temperature	Fault		*		*	*
E4-1	Abnormality of comparison of measurement (between Master CPU and Slave CPU))	CompMes CPU	Failure	*			*	*
	Abnormality of comparison of measurement (Power source)	CompMes PS	Failure	*			*	*
	Abnormality of comparison of measurement (Circuit of grid frequency)	CompMes Freq	Failure	*			*	*
	Abnormality of comparison of measurement (Circuit of grid voltage)	CompMes GridVolt	Failure	*			*	*
	Abnormality of comparison of measurement (Circuit of DC and D/D)	CompMes DcVolt	Failure	*			*	*
E4-2	Abnormity of efficiency	Efficiency Fail	Failure	*			*	*
E4-3	Failure of inverter (Output AC current)	InvFail CntrCur	Failure	*			*	*
E4-4	Abnormality of ROM version	ROMver fault	Fault					
E4-5	Abnormality of power source	PS fault	Failure	*			*	*
E4-6	Abnormality of eeprom's sum value	EepromSumFailure	Failure	*			*	*
E4-7	Failure of eeprom	EepromFailure	Failure	*			*	*
E5-1	Failure of relay (Grid relay)	RelayFail Grid	Failure	*			*	*
	Failure of relay (N phase relay)	RelayFail N	Failure	*			*	*
	Failure of relay (Relay for pre-charge)	RelayFail Pre	Failure	*			*	*
E5-2	Communication error between Master CPU and Slave CPU	CpuComFail M-S	Failure	*			*	*
	Communication error between Master CPU and Display CPU	CpuComFail M-D	Failure	*			*	*

Error code	Content of error	Contents of display[3]	content of display[2]	Mode(AUX_OUT1) (Refer to [11] of P. 3 - 15)				
		Error name	error kind	1	2	3	4	5
E5-4	Under voltage (DC/DC)	UnderVolt DD	Failure	*			*	*
	Under voltage (VD2)	UnderVolt VD2	Failure	*			*	*
	Under voltage (VD3)	UnderVolt VD3	Failure	*			*	*
E5-6	Failure of inverter (Over current)	InvFail OverCur	Failure	*			*	*
E5-7	Communication error (RS-232C or RS-485)	ComTimeout	Fault		*		*	*
E5-9	Auto Test	AutoTestFault	Fault			*	*	
A2-5	Abnormality of fan	Fan failure	Warning					
A2-6	Over voltage (D/D)	OverVolt DD	Warning					
	Over voltage (VD2)	OverVolt VD2	Warning					
	Over voltage (VD3)	OverVolt VD3	Warning					

A.2 LCD messages (Local Language)

	English	Italian	Spanish	German	French
Normal Display(display[2])					
State of running	1.23kW	(*1)	(*1)	(*1)	(*1)
State of count down	123s	(*1)	(*1)	(*1)	(*1)
State of stop	OFF	(*1)	(*1)	(*1)	(*1)
State of standby	Standby	(*1)	(*1)	Ersatz	Attente
Measurement Display(display[1])					
AC Power L1/L2/L3	Pac	(*1)	Pca	(*1)	(*1)
DC Power 1/2/3	Pdc1/2/3	(*1)	Pcc1/2/3	(*1)	(*1)
Grid Voltage L1/L2/L3	Vac	(*1)	Vca	(*1)	(*1)
Grid Frequency	Freq	(*1)	Frec	Häuf	Fréq
AC Current L1/L2/L3	Iac	(*1)	Ica	(*1)	(*1)
DC Voltage 1/2/3	Vdc1/2/3	(*1)	Vcc1/2/3	(*1)	(*1)
DC Current 1/2/3	Idc1/2/3	(*1)	Icc1/2/3	(*1)	(*1)
Daily energy production	E-today	Egiorno	E-hoy	E-Heute	E-aujour
accumulated operation time	H-total	(*1)	(*1)	H-Gesamt	(*1)
Total Periodic Energy	E-total	(*1)	P-Total	E-Gesamt	(*1)
Error Display(display[1])					
Fault	Fault	Errore	Error	(*1)	Erreur
Failure	Failure	Guasto	Fallo	Ausfall	Échec
Warning	Warning	Avviso	Aviso	Warnung	Alerte
Display of selection(display[1])					
Selection of Mode	ModeSelect	SelezioneModo	SelecciónModo	(*1)	SélectionMode
User's setup	Setup	(*1)	Config	Rahmen	(*1)
Check Settings	Check	(*1)	Comprob	Prüfen	Vérif
Error Logging	ErrLog	(*1)	(*1)	FehLog	(*1)
Display of check setup item(display[2])					
Country Setting	Country	Paese	País	Land	Pays
Compliant Standard	Standard	(*1)	(*1)	(*1)	(*1)
Grid Connection to LV/MV network (ITA only)	Grid Volt	(*1)	(*1)	(*1)	(*1)
DC Input connection (ITA only)	DC Input	(*1)	(*1)	(*1)	(*1)
OV detect level	OV_Level	OV_Livel	OV_Nivel	(*1)	OVNiveau
OV detect time	OV_Time	OV_Tempo	OV_Tiemp	OV_Zeit	OV_Heure
Voltage Rising detect level (GER, FRA, GRE, CZE, DEN, TUR)	V rise	Vaumento	Vaumento	UAnstieg	V hausse
UV detect level	UV_Level	UV_Livel	UV_Nivel	(*1)	UVNiveau
UV detect time	UV_Time	UV_Tempo	UV_Tiemp	UV_Zeit	UV_Heure
OF detect level	OF_Level	OF_Livel	OF_Nivel	(*1)	OFNiveau
OF detect time	OF_Time	OF_Tempo	OF_Tiemp	OF_Zeit	OF_Heure
UF detect level	UF_Level	UF_Livel	UF_Nivel	(*1)	UFNiveau
UF detect time	UF_Time	UF_Tempo	UF_Tiemp	UF_Zeit	UF_Heure
PF mode (GER, DEN, ITA)	cos ϕ	cos ϕ	cos ϕ	cos ϕ	cos ϕ
Reactive Power Control mode (ITA LV only)	Q	(*1)	(*1)	(*1)	(*1)
Active Power Control mode (GER, DEN, ITA)	Freq Lim	Freq Lim	Frec Lim	Freq Lim	Frèq Lim

	English	Italian	Spanish	German	French
Reconnection time	RecTime	RicTempo	RecTiemp	RecZeit	RecHeure
Auto Test detect level/time (OV L1) (ITA only)	TestOvL1	(*1)	(*1)	(*1)	(*1)
Auto Test detect level/time (OV L2) (ITA only)	TestOvL2	(*1)	(*1)	(*1)	(*1)
Auto Test detect level/time (OV L3) (ITA only)	TestOvL3	(*1)	(*1)	(*1)	(*1)
Auto Test detect level/time (UV L1) (ITA only)	TestUvL1	(*1)	(*1)	(*1)	(*1)
Auto Test detect level/time (UV L2) (ITA only)	TestUvL2	(*1)	(*1)	(*1)	(*1)
Auto Test detect level/time (UV L3) (ITA only)	TestUvL3	(*1)	(*1)	(*1)	(*1)
Auto Test detect level/time (OF) (ITA only)	TestOf	(*1)	(*1)	(*1)	(*1)
Auto Test detect level/time (UF) (ITA only)	TestUf	(*1)	(*1)	(*1)	(*1)
Model	Model	Modello	Modelo	Modell	Modèle
Rom Version	RomVer	(*1)	VerROM	(*1)	(*1)
Serial Number	SerialNo	SerieNo	No_Serie	Serial	(*1)
User's setup -> items(display[2])					
Setup of Language	Language	Lingua	Idioma	Sprache	Langue
Communication Protocol	COM_Prot	(*1)	(*1)	MIT_Prot	(*1)
Communication Unit Number	COM_Unit	(*1)	COM_Unid	MIT_Einh	(*1)
Communication Baud rate (RS-232C)	COM_232C	(*1)	(*1)	MIT_232C	(*1)
Communication Baud rate (RS-485)	COM_485	(*1)	(*1)	MIT_485	(*1)
Communication Parity	COM_Pari	(*1)	(*1)	MIT_Pari	(*1)
Communication Stop bit	COM_Stop	(*1)	(*1)	MIT_Stop	COM_Arrê
RS-485 Communication Send wait time	COM_Wait	COM_Atte	COM_Esp	MIT_Wart	COM_Atte
Grid Connection to LV/MV network (ITA only)	Grid Volt	(*1)	(*1)	(*1)	(*1)
DC Input connection (ITA only)	DC Input	(*1)	(*1)	(*1)	(*1)
Reconnection time (ITA only)	RecTime	RicTempo	RecTiemp	RecZeit	RecHeure
Change of parameter level (GRE only)	PARAM_LV	(*1)	Parám_LV	(*1)	(*1)
Setup level for control of grid voltage increasing	PF_LV	(*1)	(*1)	(*1)	(*1)
Setup of Output Signal 1	OutSig1	Uscita1	SalSeñ1	(*1)	(*1)
Setup of Output Signal 2	OutSig2	Uscita2	SalSeñ2	(*1)	(*1)
Setup of Input Signal	InputSig	Ingresso	EntSeñ	(*1)	(*1)
Error Reset	ErrReset	(*1)	ErrReset	FehReset	(*1)

	English	Italian	Spanish	German	French
Clear of Total Periodic Energy	TotalClr	TotalChi	TotalBor	TotalKla	TotalClr
Auto Test (ITA only)	AutoTest	(*1)	(*1)	(*1)	(*1)
PF mode (GER, DEN)	cos ϕ	(*1)	(*1)	(*1)	(*1)
Reactive Power Control mode (ITA LV only)	Q	(*1)	(*1)	(*1)	(*1)
Active Power Control mode (GER, DEN, ITA)	Freq Lim	Freq Lim	Frec Lim	Freq Lim	Frèq Lim
Lock In Voltage (ITA LV only)	LockInV	(*1)	(*1)	(*1)	(*1)
Lock Out Voltage (ITA LV only)	LockOutV	(*1)	(*1)	(*1)	(*1)
Lock In Power (ITA LV only)	LockInP	(*1)	(*1)	(*1)	(*1)
V1s (ITA LV only)	V1s	(*1)	(*1)	(*1)	(*1)
V2s (ITA LV only)	V2s	(*1)	(*1)	(*1)	(*1)
V1i (ITA LV only)	V1i	(*1)	(*1)	(*1)	(*1)
V2i (ITA LV only)	V2i	(*1)	(*1)	(*1)	(*1)
Startup condition of OF (ITA only)	StartOF	(*1)	(*1)	(*1)	(*1)
Startup condition of UF (ITA only)	StartUF	(*1)	(*1)	(*1)	(*1)
Auto CEI Point A (ITA LV only)	Point A	(*1)	(*1)	(*1)	(*1)
Auto CEI Point B (ITA LV only)	Point B	(*1)	(*1)	(*1)	(*1)
Auto CEI Point C (ITA LV only)	Point C	(*1)	(*1)	(*1)	(*1)
Auto CEI Point D (ITA LV only)	Point D	(*1)	(*1)	(*1)	(*1)
Frequency limit of Active Power Control (ITA only)	Flim Val	(*1)	(*1)	(*1)	(*1)
Startup frequency of Active Power Control (ITA only)	Fsta Val	(*1)	(*1)	(*1)	(*1)
User's Setup -> Set value(display[3])					
Setup of Language					
English	ENG	(*1)	(*1)	(*1)	(*1)
Italy	ITA	(*1)	(*1)	(*1)	(*1)
Spanish	ESP	(*1)	(*1)	(*1)	(*1)
German	GER	(*1)	(*1)	(*1)	(*1)
French	FRA	(*1)	(*1)	(*1)	(*1)
Communication Protocol					
Auto Detection	Auto	(*1)	(*1)	(*1)	(*1)
Compoway/F	Compoway	(*1)	(*1)	(*1)	(*1)
Modbus	Modbus	(*1)	(*1)	(*1)	(*1)
Communication Parity					
None Parity	None	(*1)	Sin Paridad	Nicht	(*1)
Even Parity	Even	Pari	Par	Eben	Pair

	English	Italian	Spanish	German	French
Odd Parity	Odd	Dispari	Impar	Merkwürdig	Impair
Grid Connection to LV/MV network (ITA only)					
Low Voltage	LowVolt	(*1)	(*1)	(*1)	(*1)
Medium Voltage	MidVolt	(*1)	(*1)	(*1)	(*1)
DC Input connection (ITA only)					
Multi (independent) input of all	DC1+DC2+DC3	(*1)	(*1)	(*1)	(*1)
Single (parallel) input of all	DC1//DC2//DC3	(*1)	(*1)	(*1)	(*1)
Multi (independent) input of DC3 and single (parallel) input of DC1 and DC2	DC1//DC2+DC3	(*1)	(*1)	(*1)	(*1)
Multi (independent) input of DC1 and single (parallel) input of DC2 and DC3	DC1+DC2//DC3	(*1)	(*1)	(*1)	(*1)
Multi (independent) input of DC2 and single (parallel) input of DC1 and DC3	DC1//DC3+DC2	(*1)	(*1)	(*1)	(*1)
Setup of Output Signal 1					
MODE1	MODE1	Modalità1	Modo1	(*1)	(*1)
MODE2	MODE2	Modalità2	Modo2	(*1)	(*1)
MODE3	MODE3	Modalità3	Modo3	(*1)	(*1)
MODE4	MODE4	Modalità4	Modo4	(*1)	(*1)
MODE5	MODE5	Modalità5	Modo5	(*1)	(*1)
Setup of Output Signal 2					
MODE1	MODE1	Modalità1	Modo1	(*1)	(*1)
MODE2	MODE2	Modalità2	Modo2	(*1)	(*1)
Setup of Input Signal					
MODE1	MODE1	Modalità1	Modo1	(*1)	(*1)
MODE2	MODE2	Modalità2	Modo2	(*1)	(*1)
Error Reset					
Execution confirmation	Are you ready?	è pronto?	¿Estás listo?	Sind Sie bereit?	Etes-vous prêt?
Executing	Executing	Esecuzione	Ejecutando	(*1)	Exécution
Execution completion	Complete	Completa	Finalizado	(*1)	Terminé
Clear of Total Periodic Energy					
Execution confirmation	Are you ready?	è pronto?	¿Estás listo?	Sind Sie bereit?	Etes-vous prêt?
Executing	Executing	Esecuzione	Ejecutando	(*1)	Exécution
Execution completion	Complete	Completa	Finalizado	(*1)	Terminé
Auto Test (ITA only)					
Execution confirmation	Are you ready?	è pronto?	¿Estás listo?	Sind Sie bereit?	Etes-vous prêt?
Waiting	Waiting	Attesa	Espera	Warten	Attente
PF mode (GER, DEN)					
Recieve external command	1.000	(*1)	(*1)	(*1)	(*1)
AUTO (Max0.95)	AUTO 0.95	(*1)	(*1)	(*1)	(*1)
AUTO (Max0.90)	AUTO 0.90	(*1)	(*1)	(*1)	(*1)
Leading PF:0.975 constant	D 0.975	(*1)	(*1)	(*1)	(*1)
Leading PF:0.950 constant	D 0.950	(*1)	(*1)	(*1)	(*1)
Leading PF:0.925 constant	D 0.925	(*1)	(*1)	(*1)	(*1)
Leading PF:0.900 constant	D 0.900	(*1)	(*1)	(*1)	(*1)
Leading PF:0.875 constant	D 0.875	(*1)	(*1)	(*1)	(*1)
Leading PF:0.850 constant	D 0.850	(*1)	(*1)	(*1)	(*1)
Lagging PF:0.975 constant	G 0.975	(*1)	(*1)	(*1)	(*1)
Lagging PF:0.950 constant	G 0.950	(*1)	(*1)	(*1)	(*1)
Reactive Power Control mode (ITA LV only)					

	English	Italian	Spanish	German	French
Recieve external command of PF	1.000	(*1)	(*1)	(*1)	(*1)
AUTO PF (Max0.95)	AUTO 0.95	(*1)	(*1)	(*1)	(*1)
AUTO PF (Max0.90)	AUTO 0.90	(*1)	(*1)	(*1)	(*1)
Leading PF:0.975 constant	D 0.975	(*1)	(*1)	(*1)	(*1)
Leading PF:0.950 constant	D 0.950	(*1)	(*1)	(*1)	(*1)
Leading PF:0.925 constant	D 0.925	(*1)	(*1)	(*1)	(*1)
Leading PF:0.900 constant	D 0.900	(*1)	(*1)	(*1)	(*1)
Leading PF:0.875 constant	D 0.875	(*1)	(*1)	(*1)	(*1)
Leading PF:0.850 constant	D 0.850	(*1)	(*1)	(*1)	(*1)
Lagging PF:0.975 constant	G 0.975	(*1)	(*1)	(*1)	(*1)
Lagging PF:0.950 constant	G 0.950	(*1)	(*1)	(*1)	(*1)
Lagging PF:0.925 constant	G 0.925	(*1)	(*1)	(*1)	(*1)
Lagging PF:0.900 constant	G 0.900	(*1)	(*1)	(*1)	(*1)
Recieve external command of reactive power	Percent	(*1)	(*1)	(*1)	(*1)
cos ϕ =f(P) Mode	AUTO CEI	(*1)	(*1)	(*1)	(*1)
Leading reactive power:5% constant	D 5	(*1)	(*1)	(*1)	(*1)
Leading reactive power:10% constant	D 10	(*1)	(*1)	(*1)	(*1)
Leading reactive power:15% constant	D 15	(*1)	(*1)	(*1)	(*1)
Leading reactive power:20% constant	D 20	(*1)	(*1)	(*1)	(*1)
Leading reactive power:25% constant	D 25	(*1)	(*1)	(*1)	(*1)
Leading reactive power:30% constant	D 30	(*1)	(*1)	(*1)	(*1)
Leading reactive power:35% constant	D 35	(*1)	(*1)	(*1)	(*1)
Leading reactive power:40% constant	D 40	(*1)	(*1)	(*1)	(*1)
Leading reactive power:45% constant	D 45	(*1)	(*1)	(*1)	(*1)
Leading reactive power:50% constant	D 50	(*1)	(*1)	(*1)	(*1)
Lagging reactive power:5% constant	G 5	(*1)	(*1)	(*1)	(*1)
Lagging reactive power:10% constant	G 10	(*1)	(*1)	(*1)	(*1)
Lagging reactive power:15% constant	G 15	(*1)	(*1)	(*1)	(*1)
Lagging reactive power:20% constant	G 20	(*1)	(*1)	(*1)	(*1)
Lagging reactive power:25% constant	G 25	(*1)	(*1)	(*1)	(*1)
Lagging reactive power:30% constant	G 30	(*1)	(*1)	(*1)	(*1)
Lagging reactive power:35% constant	G 35	(*1)	(*1)	(*1)	(*1)
Lagging reactive power:40% constant	G 40	(*1)	(*1)	(*1)	(*1)
Lagging reactive power:45% constant	G 45	(*1)	(*1)	(*1)	(*1)

	English	Italian	Spanish	German	French
Lagging reactive power:50% constant	G 50	(*1)	(*1)	(*1)	(*1)
Type B of Q=f(V) Mode	Type B	(*1)	(*1)	(*1)	(*1)
Active Power Control mode (GER, DEN, ITA)					
Disable	OFF	(*1)	(*1)	(*1)	(*1)
Enable	ON	(*1)	(*1)	(*1)	(*1)

*1 The content of the display is the same as English.

The table below shows the list of Error and the content of the display of each language.

Error code	Content of error	Contents of display[3]				
		Error name				
		English	Italian	Spanish	German	French
E1-1	Over voltage (Grid)	Grid OV	Err Rete OV	Grid OV	Grid OV	Grid OV
E1-2	Under voltage (Grid)	Grid UV	Err Rete UV	Grid UV	Grid UV	Grid UV
E1-3	Over frequency (Grid)	Grid OF	Err Rete OF	Grid OF	Grid OF	Grid OF
E1-4	Under frequency (Grid)	Grid UF	Err Rete UF	Grid UF	Grid UF	Grid UF
E1-5	Islanding passive	IslandingPassive	Isola passiva	Mode isla pasivo	Insel passive	île passive
E1-6	Islanding active	IslandingActive	Isola attiva	Mode isla detect	Insel betriebs	île active
E1-7	Over voltage instantly (Grid)	OV instantly	OV immediata	OV instante	OV sofort	OV instantaném
E1-8	Under voltage instantly (Grid)	UV instantly	UV immediata	UV instante	UV sofort	UV instantaném
E1-0	No Utility	No Utility	Assenza rete	No Utility	No Utility	No Utility
E2-1	Over voltage (DC)	DCOverVolt	Sovratensione cc	PVEncimaVolt	PVÜberVolt	PVDessusVolt
E2-3	Ground I fault	Ground I fault	Err Dispersione	Terreno I fallo	Erdung I Fault	Ground I Fautes
E2-4	Insulation resistance fault	RISO fault	Err Isolamento	RISO fallo	RISO Fault	RISO Fautes
E3-1	Over Current (DC)	OverDcCurr	Sovracorrente cc	EncimDcActual	ÜberDcAktuell	DessuDcActuel
E3-2	Over Current (AC)	OverAcCurr	Sovracorrente ac	EncimAcActual	ÜberAcAktuell	DessuAcActuel
E3-3	Failure of inverter (DC current injection)	InvFail DcINJ	InvFall DcINJ	InvFalla DcINJ	InvAusf DcINJ	Inv Échec DcINJ
E3-4	Over temperature	Over temperature	Sovratemperatura	EncimTemperatura	ÜberTemperatur	DessuTempérature
E4-1	Abnormality of comparison of measurement (between Master CPU and Slave CPU)	CompMes CPU	ConfMis CPU	ComMed CPU	VerglMes CPU	ComprDim CPU
	Abnormality of comparison of measurement (Power source)	CompMes PS	ConfMis PS	ComMed PS	VerglMes PS	ComprDim PS
	Abnormality of comparison of measurement (Circuit of grid frequency)	CompMes Freq	ConfMis Freq	ComMed Freq	VerglMes Freq	ComprDim Freq
	Abnormality of comparison of measurement (Circuit of grid voltage)	CompMes GridVolt	ConfMis GridVolt	ComMed GridVolt	VerglMes GridVolt	ComprDim GridVolt
	Abnormality of comparison of measurement (Circuit of DC and D/D)	CompMes DcVolt	ConfMis DcVolt	ComMed DcVolt	VerglMes DcVolt	ComprDim DcVolt
E4-2	Abnormity of efficiency	Efficiency Fail	Efficienza Fall	Eficiencia Falla	Effizienz Ausfall	Efficacité Échec
E4-3	Failure of inverter (Output AC current)	InvFail CntrCur	InvFail CntrCur	InvFail CntrCur	InvFail CntrCur	InvFail CntrCur
E4-4	Abnormality of ROM version	ROMver fault	ROMVersionFault	ROMVersiónFallo	ROMVerFault	ROMver fautes
E4-5	Abnormality of power source	PS fault	PS fault	PS fallo	PS fault	PS fautes
E4-6	Abnormality of eeprom's sum value	EepromSumFailure	EepromSumFallime	EepromSumFalla	EepromSum Ausfall	EepromSumÉchec

Error code	Content of error	Contents of display[3]				
		Error name				
		English	Italian	Spanish	German	French
E4-7	Failure of eeprom	EepromFailure	EepromFallime	EepromFalla	EepromAusfall	EepromÉchec
E5-1	Failure of relay (Grid relay)	RelayFail Grid	ReléFall Grid	ReléFalla Grid	RelaisAusf Grid	RelaisÉchec Grid
	Failure of relay (N phase relay)	RelayFail N	ReléFall N	ReléFalla N	RelaisAusf N	RelaisÉchec N
	Failure of relay (Relay for pre-charge)	RelayFail Pre	ReléFall Pre	ReléFalla Pre	RelaisAusf Pre	RelaisÉchec Pre
E5-2	Communication error between Master CPU and Slave CPU	CpuComFail M-S	CpuComFall M-S	CpuComFalla M-S	CpuComAusf M-S	CpuComÉchec M-S
	Communication error between Master CPU and Display CPU	CpuComFail M-D	CpuComFall M-D	CpuComFalla M-D	CpuComAusf M-D	CpuComÉchec M-D
E5-4	Under voltage (DC/DC)	UnderVolt DD	SottoVolt DD	DebajoVolt DD	UnterVolt DD	SousVolt DD
	Under voltage (VD2)	UnderVolt VD2	SottoVolt VD2	DebajoVolt VD2	UnterVolt VD2	SousVolt VD2
	Under voltage (VD3)	UnderVolt VD3	SottoVolt VD3	DebajoVolt VD3	UnterVolt VD3	SousVolt VD3
E5-6	Failure of inverter (Over current)	InvFailOverCur	InvFallOltre Cur	InvFallaEncim Cur	InvAusfÜber Cur	Inv ÉchecDessu Cur
E5-7	Communication error (RS-232C or RS-485)	ComTimeout	ComTimeout	ComTimeout	ComTimeout	ComTimeout
E5-9	Fault of Auto Test	AutoTestFault	Errore AutoTest	AutoTestFallo	AutoTestFault	AutoTestFautes
A2-5	Abnormality of fan	Fan failure	VentlaFallime	FallaVentilador	LüfterAusfall	Fan échec
A2-6	Over voltage (D/D)	OverVolt DD	OltreVolt DD	Encim voltaje DD	ÜberVolt DD	DessusVolt DD
	Over voltage (VD2)	OverVolt VD2	OltreVolt VD2	Encim voltaje VD2	ÜberVolt VD2	DessusVolt VD2
	Over voltage (VD3)	OverVolt VD3	OltreVolt VD3	Encim voltaje VD3	ÜberVolt VD3	DessusVolt VD3
---	No Record	No Record	Nessun record	Sin Datos	Keine Daten	Pas de dossier

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Note: Specifications subject to change without notice.

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